Writing Clinical Items for the DM in Child Health

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School of Education

Objectives

* **PARTICIPANTS WILL**
* **Develop basic competence in writing popular clinical items**
* **Gain the capacity to make better judgments on item/assessment selection based on purpose**
* **Gain insight and practice into item review procedures**

Schedule

* 9.00-9.45-Introduction to Selected Response Questions used in Medical Education
* 9.45-10.10-Miller's Pyramid/The challenge of measuring clinical decision-making
* ---- break---
* 10.20-10.45-Writing protocol for items measuring clinical decision-making/ item shells/Item Models
* 10.45-11.30-Focus on producing vignettes (Writing in Pairs)
* --Working lunch--
* 12.15-1.45-Question Review
* --break--
* 2.00-2.30-Using item analysis and think alouds to improve quality
* 2.30-3.00-item banks, item writing skill, automatic item generation, and computer based testing

Approaches

* Guided Discussions
* Readings
* Group Reviews
* Writing in Pairs
* Peer And Group Feedback
* Tutor Feedback

Choosing the right assessment/assessment format

* Purpose is everything
* Use multiple formats to balance advantages and disadvantages
* Learn how formats function using item analysis software-CTT-LERTAP, ITEMAN 4, CITAS

Different written assessment methods: what can be said about their strengths and weaknesses?

LAMBERT W T SCHUWIRTH & CEES P M VAN DER VLEUTEN

INTRODUCTION Written assessment techniques can be subdivided according to their stimulus format – what the questions asks – and their response format – how the answer is recorded. The former is more important in determining the type of competence being asked for than the latter. It is nevertheless important to consider both when selecting the most appropriate types. Some major elements to consider when making such a selection are cueing effect, reliability, validity, educational impact and resource-intensiveness.

RESPONSE FORMATS Open-ended questions should be used solely to test aspects that cannot be tested with multiple-choice questions. In all other cases the loss of reliability and the higher resource-intensiveness represent a significant downside. In such cases, multiple-choice questions are not less valid than open-ended questions.

STIMULUS FORMAT When making this distinction, it is important to consider whether the question is embedded within a relevant case or context and cannot be answered without the case, or not. This appears to be more or less essential according to what is being tested by the question. Context-rich questions test other cognitive skills than do context-free questions. If knowledge alone is the purpose of the test, context-free questions may be useful, but if it is the application of knowledge or knowledge as a part of problem solving that is being tested, then context is indispensable.

CONCLUSION Every format has its (dis)advantages and a combination of formats based on rational selection is more useful than trying to find or develop a panacea. The response format is less important in this respect than the stimulus.

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KEYWORDS education, medical, undergraduate/*methods; educational measurement/standards; *writing; clinical competence/standards.

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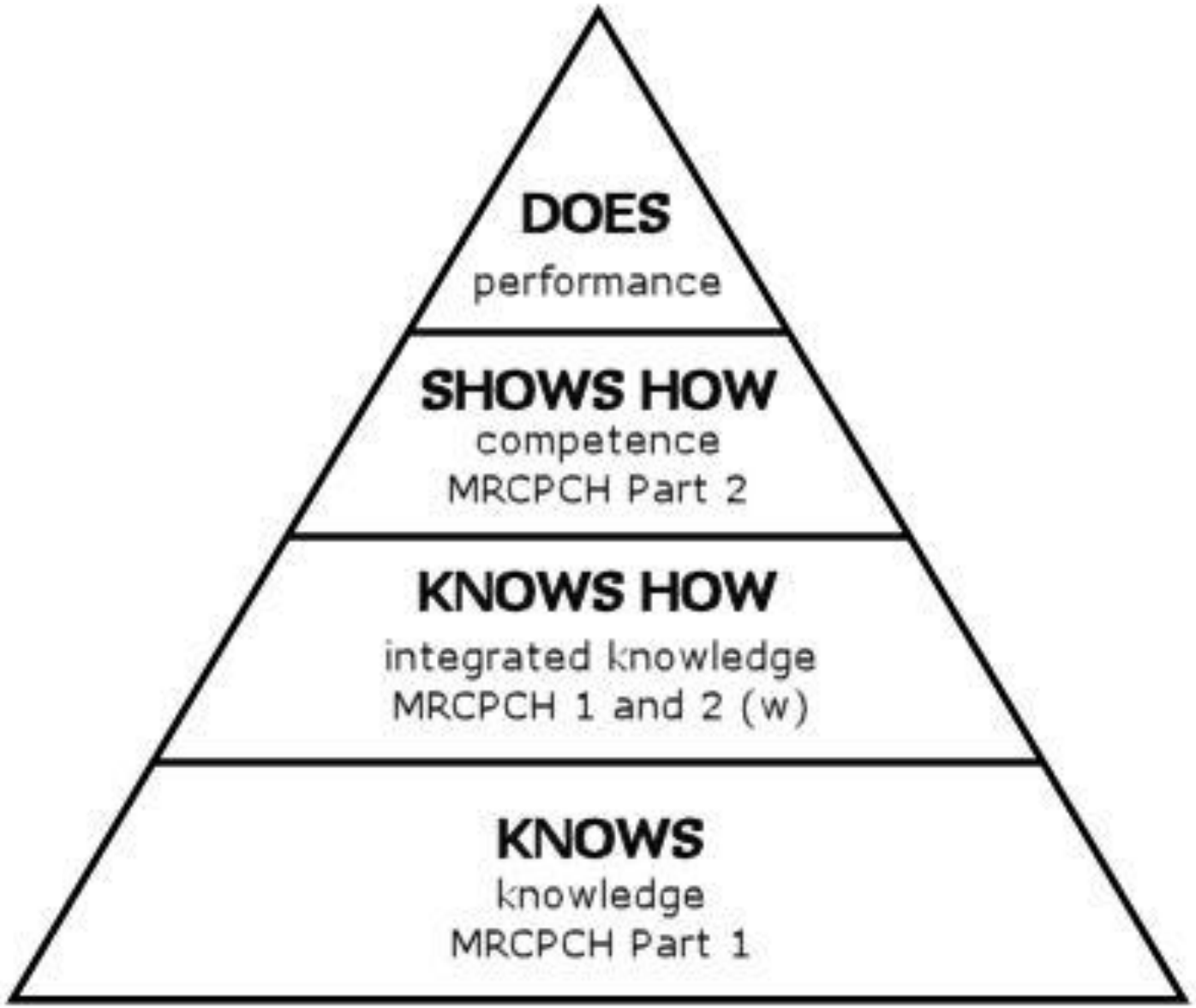
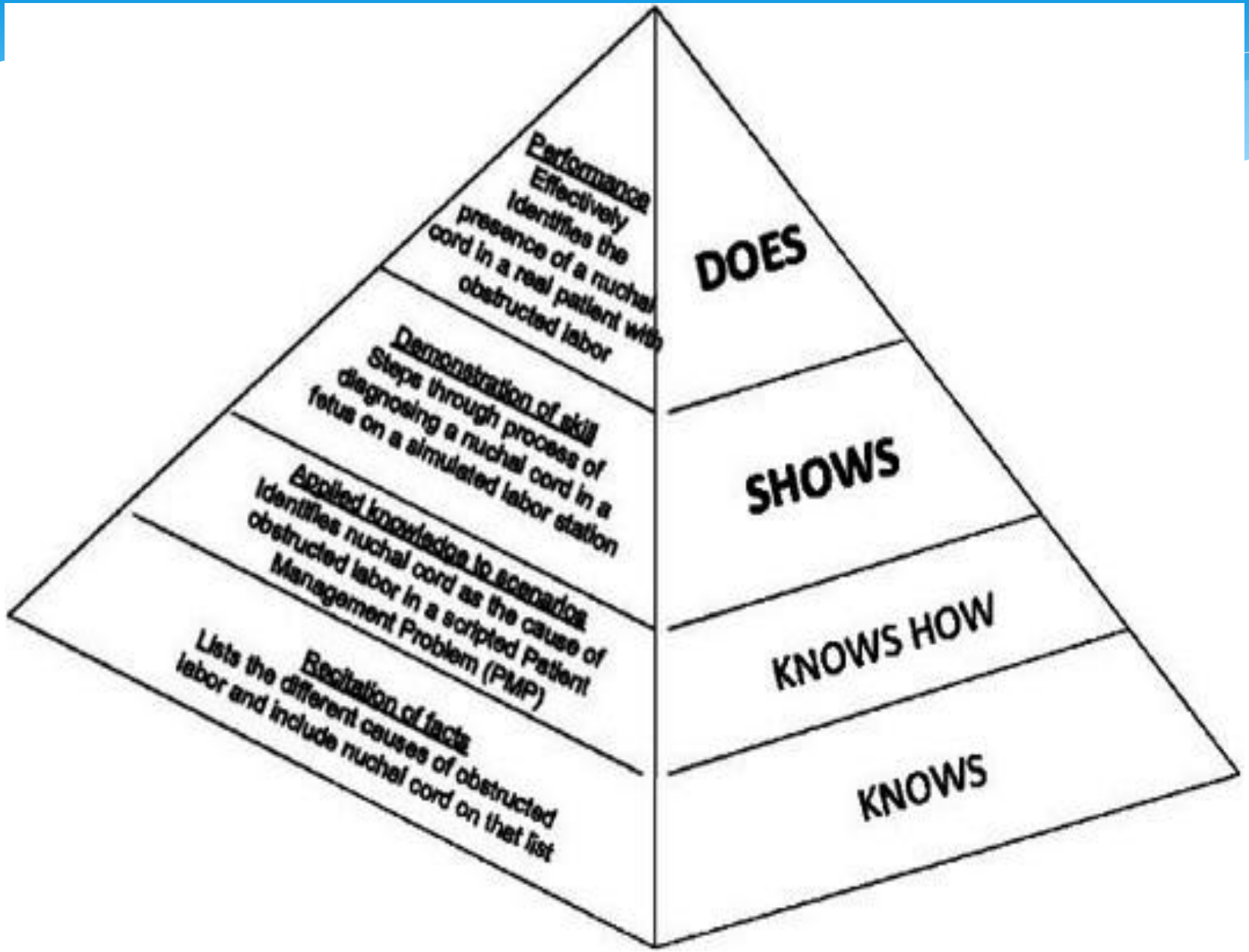
INTRODUCTION

In attempts to improve written methods for the assessment of medical competence a wide variety of question types has been developed. Each method – with its own acronym – has been promoted as superior to others and as being able to test higher order cognitive skills. Unfortunately, methods are most commonly subdivided into open-ended and multiple-choice question types. This subdivision focuses only on the answer format (the so-called response format) and ignores the other valuable aspect of the question, namely the stimulus format. The stimulus indicates what the question wants the candidate to answer, and thus pertains to the content of the question. The response format indicates how the response of the candidate is captured. Four sample items illustrating the possible combinations of stimulus and response formats are shown in the Appendix. The distinction may seem artificial but it is essential, both conceptually and for the practice of constructing written tests.[1] A number of studies have investigated exactly which factor determines the kind of thought processes invoked by written questions.[2–5] They converge on the conclusion that the stimulus is essential for what is being measured, while the format is less so. Studies comparing open-ended questions with multiple-choice questions have shown repeatedly that, although mean scores on the

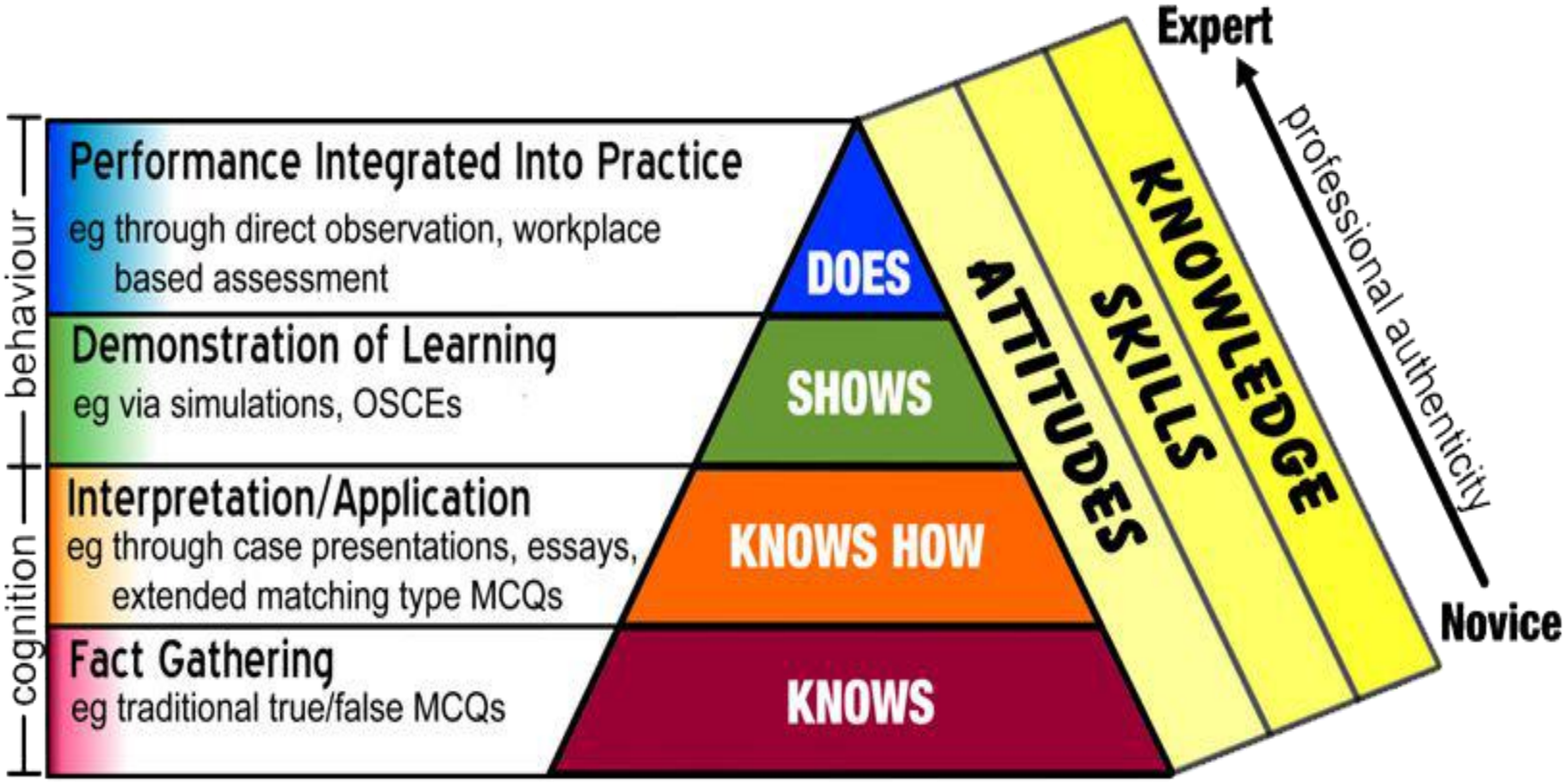
Miller's Pyramid categorizes purpose


DOES
performance
SHOWS HOW
competence
MRCPCH Part 2
KNOWS HOW
integrated knowledge
MRCPCH 1 and 2 (w)
KNOWS
knowledge
MRCPCH Part 1


Performance
Effectively identifies the presence of a nuchal cord in a real patient with obstructed labor
DOES
Demonstration of skill
Steps through process of diagnosing a nuchal cord in a fetus on a simulated labor station
SHOWS
Applied knowledge to scenarios
Identifies nuchal cord as the cause of obstructed labor in a scripted Patient Management Problem (PMP)
KNOWS HOW
Recitation of facts
Lists the different causes of obstructed labor and include nuchal cord on that list
KNOWS

MILLER'S PRISM OF CLINICAL COMPETENCE (aka Miller's Pyramid)

it is only in the "does" triangle that the doctor truly performs



Based on work by Miller GE, The Assessment of Clinical Skills/Competence/Performance; Acad. Med. 1990; 65(9); 63-67
Adapted by Drs. R. Mehay & R. Burns, UK (Jan 2009)

	Best used to assess				Strengths				
	Attitudes	Knowledge	Skills	Performance	Low cost	Appropriate for formative assessment	Accepted as summative assessment	Objective	Learner-centered
Rating forms	Y	Y	Y	Y	Y	Y	Y	N	N
Self-assessment	Y	Y	Y	Y	Y	Y	N	N	Y
Essays/journals	Y	Y	N	N	Y	Y	N	N	Y
Written or computer-based constructed response tests	N	Y	N	N	Y	N	Y	Y	N
Oral exams	Y	Y	N	N	N	Y	Y	N	Y
Direct observation including OSCEs	N	N	Y	Y	N	Y	Y	N	N

Recommended uses and strengths of common assessment methods.

Assessment in Graduate Medical Education-A primer for Pediatric Program Directors

Selected Response Questions?

* SELECTED RESPONSE ITEM/TASK- An exercise for which examinees must choose a response from an enumerated set (e.g. multiple choice or matching) rather than create their own responses or products (as in performance assessment).

* CONSTRUCTED RESPONSE ITEM/TASK- An exercise for which examinees must create their own responses or products (performance assessment) rather than choose a response from an enumerated set (multiple choice).

* A performance assessment is a task in which the student's active generation of a response is observable either directly or indirectly via a permanent product

Table 4: Psychometric properties of Different MCQ items.

ITEM TYPE	NBME Categorization	Psychometric Characteristics & Uses	Allows Integration?
Conventional Multiple Choice One-best Answer	A-type	When well written, these items are usually reliable, with 5-options the best. Remember to avoid clues and wordiness for best performance. There is a tendency for inexperienced writers to assess lower level cognitive outcomes.	Requires Problem Set
A-type with confidence level	Not used	These items are susceptible to test-taker personality characteristics	Requires Problem set
Problem solving sets/ Pictorial items	Sets of A-type (formerly called G-types)	Items allow integration of content and very high discrimination possible. They can also be used for assessing higher order cognitive outcomes.	Yes!
Simple True-False/Alternate Response	E & H-types (No longer used)	These items are not reliable and are very susceptible to guessing. Despite recommendations by Ebel (1972, 1991), they are rarely used in high stakes tests and are not often recommended by experts in general education.	No!
Complex Multiple-Choice	K-Type (Complex True/False)	Arguably, these items result in added extraneous difficulty due to item structure However; they can be appropriate if infrequently used. They are not recommended by the NBME.	Requires Problem Set
Multiple True-False (MTFs)	X-type (Multiple true/false) (no longer used)	Use of testlets will reduce reliability of overall test. However, if items are written well, can achieve overall high reliability and validity, but there is a tendency towards ambiguous wording.	Yes!
Simple Matching	B, C, & D-Types (no longer used)	Reliable, though less so than R-type. They are not always highly discriminating. However, they can summarize large quantities of information, but are rarely used in high stakes testing	No!
Complex Matching	D-type (no longer used)	Low discrimination and difficult to write. Sometimes used for lists. EMQs are an option.	Possible
Extended Matching	R-type Pick N-items	Reliable and highly discriminating. They are often appropriate to multiple lists of items.	Possible

Understanding item structures

Understanding the terminology

Table 7: Definitions & Terminology of selected response items

Component	Definition
Vignette	An illustrative case focusing upon the clinical context, the patient, or laboratory and other data.
Stem	The problem and a lead in stated as a question or as an incomplete statement
Alternatives Choices Options	A list of suggested solutions (words, numbers, symbols, or phrases)
Option set	A list of themes options for an EMQ
Answer Keyed Response	Correct alternative
Distractors Decoys Foils	Incorrect alternatives

SRs in the Clinical Sciences

Type	Added purpose
Simple	Facts
Case-based (context dependent)	Applied Knowledge
Figural Simple or Case Based	Authenticity/ Interpretation
EMQs	Applied Knowledge
Problem Sets	Applied & Integrated Knowledge
Case Clusters	Applied & Integrated Knowledge
PNQ	High discrimination/authentic clinical application of knowledge

Simple

Q1. A patient's serum SMA 6 result reveals Na 136, Cl 104, K 4.0, BUN 21, creatinine 0.9, and glucose 90. What is the serum osmolality?

a. 270
b. 280
c. 284
d. 300
e. 310

Q2. The term DKA (diabetic keto acidosis) means all of the following except:

a. Serum glucose is more than 300 mg/dL
b. Ketonemia
c. pH less than 7.30
d. Bicarbonate less than 15 mEq/L
e. Absence of ketone in the urine

Q3. Human beta cells can be infected by all of the following organisms expect:

a. Coxsackievirus
b. Group B streptococcus (GBS)
c. CMV
d. Mumps
e. Rubella

Q4. The first abnormality noted in iron deficiency anemia is:

a. Reduced iron stores in tissue (hemosiderin in bone marrow disappear)
b. Reduced serum ferritin
c. Reduced serum iron and incresed TIBC (total iron-binding capacity)
d. Increased FEP (free erythrocyte protoporphyrin)
e. Decreased MCH & MCV

Question 5

A 1 year old child whose weight is below the 2nd centile

A is failing to thrive

B is probably malnourished

C is within 2 standard deviations of the mean

D requires a family assessment by a social worker

E requires referral to a paediatrician

Question 6

An umbilical hernia

A if still present at 6 months requires surgical repair

B is a cause of recurrent abdominal pain in childhood

C is a feature of babies with untreated congenital hypothyroidism

D is more commonly found in Caucasian than Afro-Caribbean babies

E poses a significant risk of intestinal obstruction

Question 7

Causes of haematuria in a 2 year old child include:

A Fabricated illness by carers

B Hypercalciuria

C Minimal change nephrotic syndrome

D Neuroblastoma

E Sickle cell disease

Question 8

Recurrent periumbilical pain in an otherwise healthy 8 year old girl

A has an organic cause in more than 20% of cases

B if functional, characteristically wakes the child at night

C is commonly associated with headaches

D is frequently due to Helicobacter pylori infection

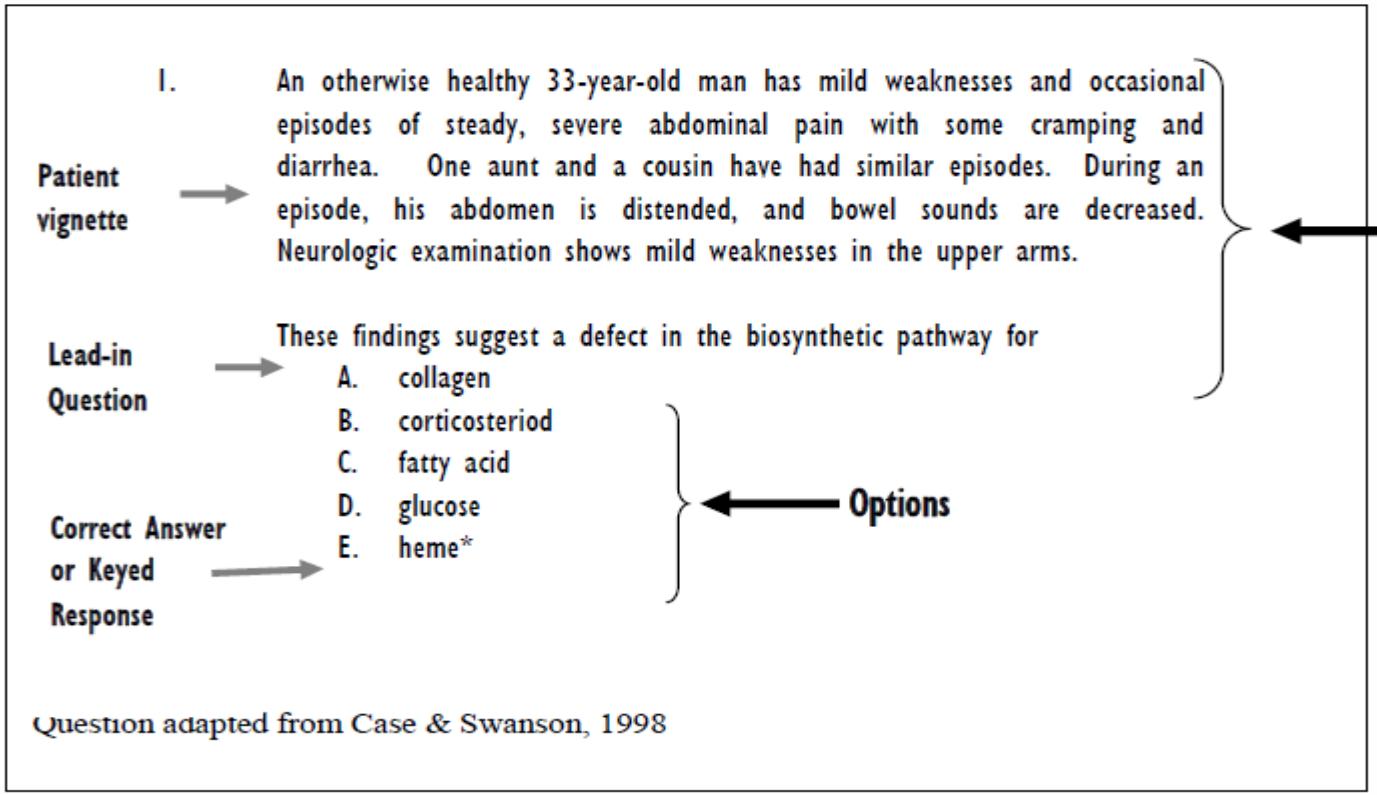
E is likely to be organic in origin if associated with poor school attendance

Case-based

Item structure in 1-in-4/5 Context-dependent MCQs

The stem in this format includes the clinical/patient vignette and the lead in question or phrase that leads directly into the options. A good stem will stand on its own and can be answered without reference to the options.

The options are the different alternatives that can be selected. In this example, there are four distractors (wrong options) and one correct answer (The keyed response).



Question adapted from Case & Swanson, 1998

A 5 month old boy has had several hospital admissions with episodes of reduced conscious level, altered muscle tone and abnormal movements. These last for several hours and have remained unexplained despite extensive in-patient investigation. He is found cyanosed and apnoeic whilst being cared for by his mother in a cubicle. He responds rapidly to basic life support. Continuous nursing supervision is arranged.

42. What is the most appropriate next step? (4 marks)

SELECT ONE ANSWER ONLY

A Arrange a skeletal survey.

B Confront the mother about your suspicions.

C Refer to social services.

D Repeat full infection screen.

E Seek an immediate Police Protection Order.

A 15 year old girl with focal epilepsy comes to clinic having had 5 seizures in the past 2 weeks. Her seizures were previously well controlled on carbamazepine. She was otherwise well except for a cough over the past month for which she has been taking erythromycin. She has recently started on the oral contraceptive pill.

24. What would be the next step with management? (3 marks)

SELECT ONE ANSWER ONLY

A Add other anti-epileptic drug

B Check carbamazepine level

C Consider another form of contraception

D CT head scan

E Increase dose of carbamazepine

A 3 day old girl presented with swelling and bruising of the right eyelid. She had been born at term by ventouse delivery due to fetal distress. Birth weight was 2.3 kg and she did not require resuscitation. She vomited 15 minutes after receiving oral vitamin K. She was otherwise well and feeding had been established without difficulty.

Investigations

Blood

haemoglobin	14.4 g/dl
white cell count	6.5 x 10^9/l
normal differential	
platelets	29 x 10^9/l
CRP	5 mg/l

5. Which of the following is the most important information contributing to the explanation of her problem? (4 marks)

SELECT ONE ANSWER ONLY

A family history of easy bruising

B low maternal platelet count in pregnancy

C maternal anti-epileptic medication during pregnancy

D perinatal risk factors for Group B Streptococcal sepsis

E vomiting after vitamin K administration

Scenario 7

A 64-year-old retired estate agent is brought into the Emergency Department in a confused and agitated state. His wife states that over the last month he has lost a considerable amount of weight and has complained of increasing fatigue. He also has been passing water far more frequently recently and has started to take a jug of water to bed at night.

His routine blood tests are returned as:

Sodium	150 mmol/l
Potassium	5 mmol/l
Creatinine	105 µmol/l
Urea	9 mmol/l
Calcium	2.5 mmol/l
Albumin	45 g/l
Glucose	27 mmol/l
Chloride	90 mmol/l
CRP	5 mg/l

S7.1 What is the calculated plasma osmolality in mosmol/kg?

- ○ A 190
- ○ B 254
- ○ C 337
- ○ D 346
- ○ E 414

A 12 year old girl with frontal lobe epilepsy presents with a 4 day history of fever cough vomiting and drowsiness.

Investigations

Blood

sodium	116 mmol/l
potassium	2.8 mmol/l
chloride	90 mmol/l
urea	1.8 mmol/l
creatinine	40 umol/l
bicarbonate	19 mmol/l
osmolality	247 mmol/kg
urine	107 mmol/kg
sodium	18 mmol/l
potassium	19 mmol/l
chloride	< 15 mmol/l

58. Which of the following is the most likely cause of her current biochemical findings? (3 marks)

SELECT ONE ANSWER ONLY

A Addison's disease

B cerebral salt wasting

C excessive water drinking

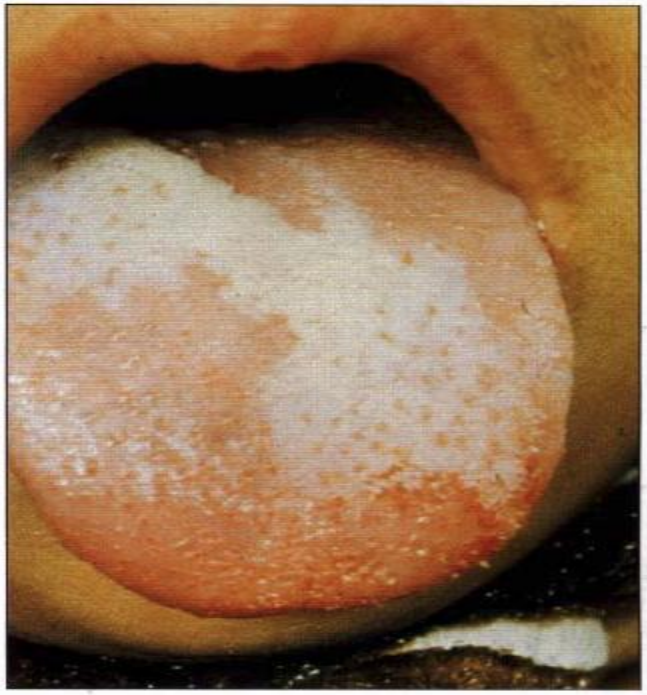
D pseudohyponatremia

E syndrome of inappropriate anti-diuretic hormone secretion (SIADH)

Figural Questions

Question 1

The illustration shows the tongue of an otherwise healthy child. Her mother was worried about this appearance.



1. Which of the following is the most appropriate management? (3 marks)

SELECT <u>ONE</u> ANSWER ONLY

A biopsy of the white area

B determine HIV status

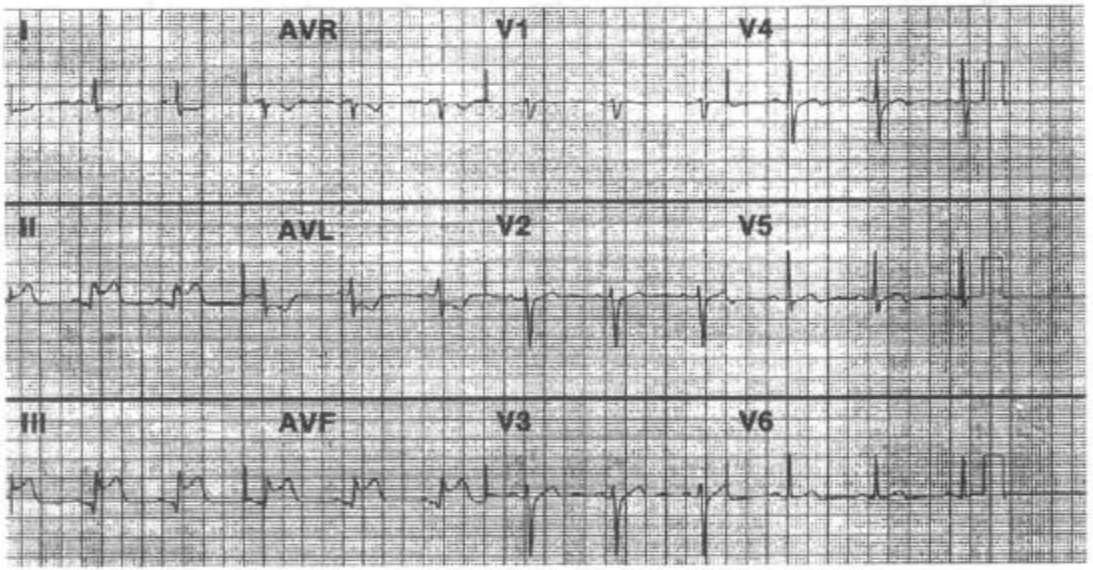
C follow up for observation

D nystatin

E offer reassurance

A 62-year-old man with long-standing diabetes presents with acute-onset of breath and "feeling sweaty." He is on multiple medications, including captopril, metformin, pioglitazone, and amlodipine. Physical examination and vital signs are within normal limits other than tachypnea and diaphoresis.

Clinical Scenario



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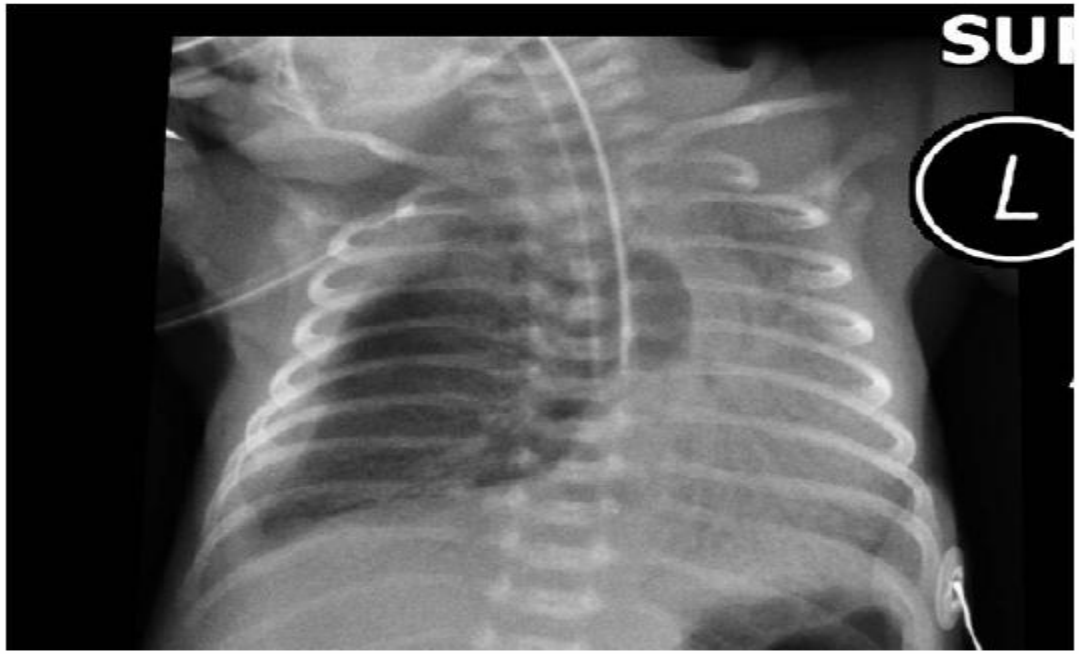
Looking at the electrocardiogram, what is the most likely cause for the patient's symptoms?

Lead-in

A. Acute myocardial infarction
B. Hyperkalemia
C. Pericaditis
D. Atrial fibrillation
E. Third Degree heart block

Options

A baby girl was born at 30 weeks gestation. She received Curosurf, was ventilated for 12 hours and then weaned to CPAP. On day 3 she suddenly deteriorated with desaturations and bradycardias. Chest x-ray showed a right pneumothorax and a chest drain was inserted. She was reintubated and ventilated on SIMV at pressures of 20/4 cmH_2O, rate 35/minute, I time 0.4s, in 27% oxygen. One hour later her condition worsened significantly. Her chest x-ray is shown in the figure below.



R L

8. What is the next most appropriate action? (3 marks)

SELECT <u>ONE</u> ANSWER ONLY

A increase peak inspiratory pressure on ventilator

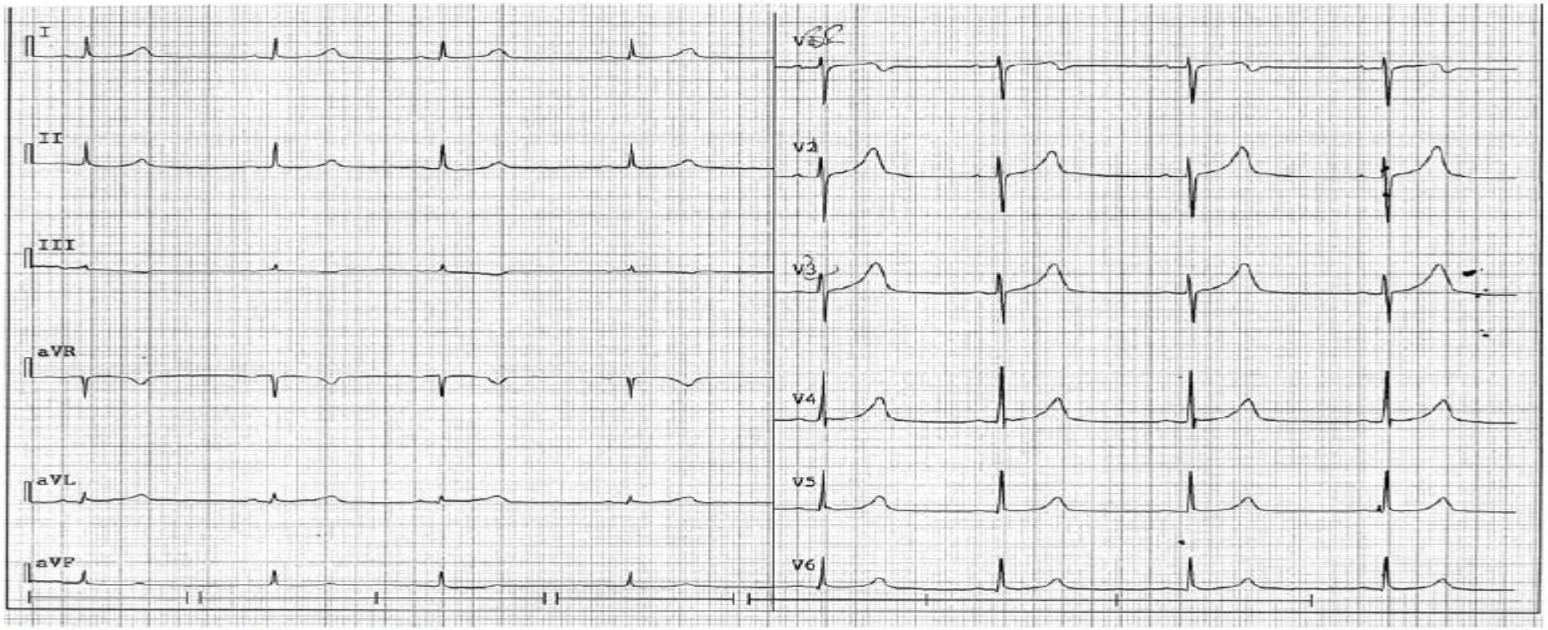
B manipulate existing chest drain

C needle thoracentesis right chest

D replace chest drain

E reposition endotracheal tube

A 15 year old boy presented with short self-limiting episodes of syncope. They occurred when he went to clubs with his friends.



25 mml / sec 10 mm / Mv

9. What significant abnormality is shown on his resting ECG? (3 marks)

SELECT <u>ONE</u> ANSWER ONLY

A complete heart block

B first degree heart block

C left bundle branch block

D left ventricular hypertrophy

E prolonged Q-T interval

F right bundle branch block

G sinus arrhythmia

H sinus bradycardia

I sinus rhythm

J Wolff-Parkinson-White syndrome

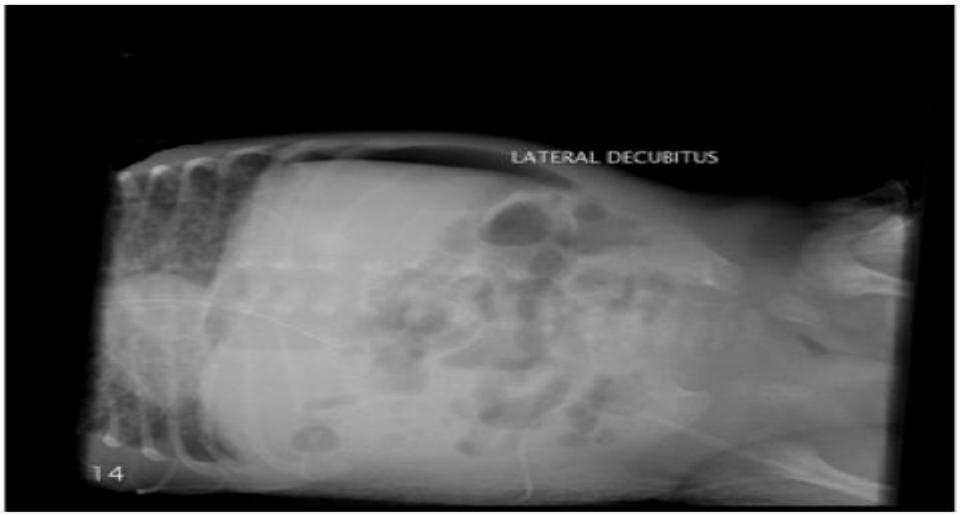
This 28 week gestation baby, currently ventilated, has had a worsening metabolic acidosis over the last 24 hours. His heart rate is 180/minute and mean blood pressure is 26 mmHg. He has developed peripheral oedema. Due to bilious aspirates an abdominal x-ray was performed.

Investigations

Blood gas

pH	7.01
pCO2	5.5kPa (41.2 mmHg)
pO2	8.1kPa (61 mmHg)
HCO3	10.2 mmol/l
BE	-17.0 mmol/l

This is his abdominal x-ray.



26. What is the most appropriate immediate management? (4 marks)

SELECT <u>ONE</u> ANSWER ONLY

A administer 1mmol/kg sodium bicarbonate

B fluid resuscitation with 10mls/kg 0.9% saline

C increase ventilation pressures and rate

D needle aspiration

E start intravenous antibiotics

EMQs

THEME Heart Failure

THEME

K. Acute myocarditis
L. Aortic stenosis
M. Congentive cardiomyopathy
N. Endocarditis
O. Endomyocardial fibrosis
P. Hypertrophic obstructive cardiomyopathy
Q. Ischaemic cardiomyopathy
R. Pancarditis
S. Pericarditis
T. Pulmonary hypertension

OPTION SET (5 to 26 options)

STEMS/

For each of the following patients with heart failure, select the most likely diagnosis.

4. A 28-year-old man presents to his general practitioner with a sore throat. He has been previously well and is reassured that no specific therapy is required. He returns 3 weeks later complaining of shortness of breath, and pains in his joints. On examination he has features of heart failure, soft systolic and diastolic murmurs, and tender, bruise-like nodules on his shins. A throat swab grows streptococcus viridans.

5. A 39-year-old woman is seen in A & E after collapsing in the town centre. She recalls rushing for the bus before feeling "faint." She is concerned because she has similar symptoms several times before when exerting herself and her brother has recently died suddenly of some sort of heart problem. On examination she has a thrusting cardiac impulse, mid-systolic murmur at the left sternal edge, a "jerky" pulse, and basal inspiratory crackles.

6. A 30-year-old woman with systemic lupus erythematosus (SLE) develops sharp central chest pains that is worse lying back and somewhat relived by sitting forwards.

Source: Alcolado & Mir (2002). Extended-matching questions for finals, p. 117.

This is a list of diagnoses:

A aortic stenosis

B breath holding attack

C complex partial seizures ("petit mal")

D fabricated seizure

E febrile seizure

F hypoglycaemia

G juvenile myoclonic epilepsy

H long QT syndrome

I reflex anoxic seizures

J rolandic seizures

Choose the most likely diagnosis for each of the following scenarios:

SELECT ONE ANSWER ONLY FOR EACH QUESTION
Note: *Each answer may be used more than once*

10. The mother of an 8 year old girl with type I diabetes gives a history of her daughter having shaking episodes during her sleep between 6 and 7am. During the episodes the girl is unresponsive and afterwards takes at least 30 minutes to get back to her normal self. Her blood sugar was 3.5 mmol/l during the most recent episode. Her parents have recently separated; she has a cousin on treatment for epilepsy. (3 marks)

11. A 2 year old girl is referred to outpatients for investigation of 2 episodes of unconsciousness. She becomes pale and shakes her arms and legs. One of these episodes happened when she fell off her tricycle on a day when she also had a mild elevation of temperature. The second episode occurred when another child pinched her at nursery. She has no significant previous medical history and her development is normal. (3 marks)

12. A 14 year old boy with type 1 diabetes presents with a series of collapses at school. His teacher provides a written history of the boy "going down like a sack of potatoes". The boy has no recall of events during these collapses. His neurological, cardiac examination and blood pressure are all normal. (3 marks)

The following is a list of respiratory diagnoses:

A aspergillosis

B asthma

C bronchiectasis

D cystic fibrosis

E foreign body aspiration

F habitual cough

G immune deficiency

H pertussis

I primary ciliary dyskinesia

J tracheobronchomalacia

Choose the most likely diagnosis for each of the following scenarios:

SELECT ONE ANSWER ONLY FOR EACH QUESTION
Note: *Each answer may be used more than once*

2. A previously well 8 year old boy presents with a 2 month history of cough. He has episodes of nocturnal and daytime paroxysmal cough intermittently productive of clear sputum. He has had a trial of inhaled corticosteroids which have not had any benefit. He has been fully vaccinated for his age. (3 marks)

3. A 6 year old boy has a 6 month history of a loud, non-productive cough noticed by his mother at breakfast time. He has poor school attendance. His height and weight are on the 50th centile. (3 marks)

4. A 2 year old Caucasian boy with a history of chronic rhinitis and recurrent otitis media presents with a 4 week history of recurrent cough and purulent sputum production. (3 marks)

Problem Solving Sets & Case Clusters

A 22-year-old man presents to the county sexually transmitted disease (STD) clinic complaining of an ordourless discharge from his penis for the past week. He has had two sexual partners in past month. He has been in touch with both, and neither has had any genitourinary symptoms.

Vignette

1. Which of the following is a likely pathogen in the case and the most common sexually transmitted infection?

   A. *Neisseria gonorrhoeae*
   B. *Chalmydia trachomatis**
   C. *Treponema palladium*
   D. herpes simplex, type 2
   E. *trichomonas vaginalis*

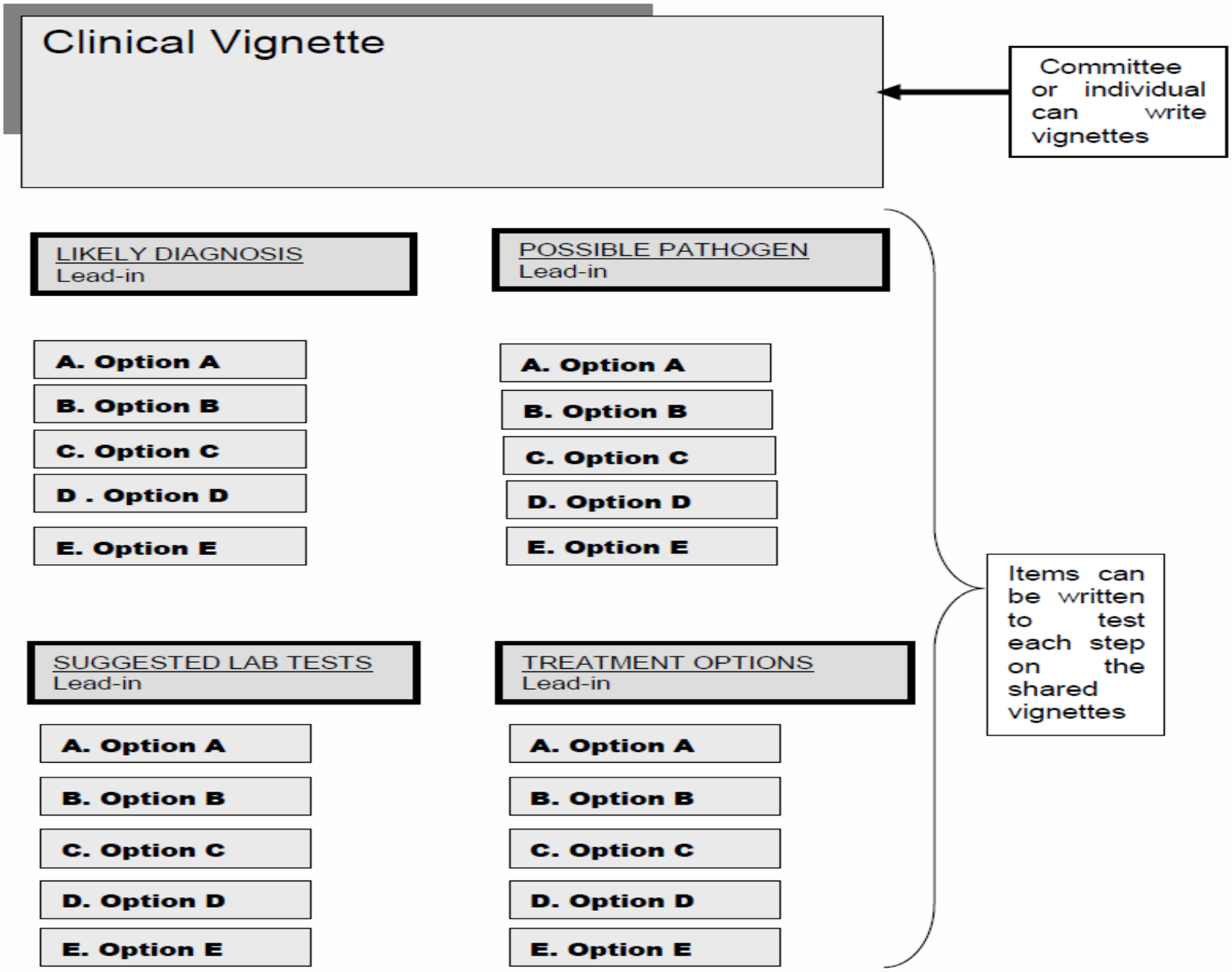
2. What is the treatment of choice for this condition?

   A. pencillin
   B. acyclovir
   C. metronidazole
   D. doxycycline*
   E. tinidazole

Linked items

3. What of the following is a serious long-term complication of this infection?

   A. heart damage
   B. degeneration of the anterior horn cells in the spinal column
   C. blindness secondary to uveitis
   D. chronic persistent hepatitis
   E. infertility in sexual partners*


Clinical Vignette
Committee or individual can write vignettes
LIKELY DIAGNOSIS
Lead-in
A. Option A
B. Option B
C. Option C
D . Option D
E. Option E
POSSIBLE PATHOGEN
Lead-in
A. Option A
B. Option B
C. Option C
D. Option D
E. Option E
SUGGESTED LAB TESTS
Lead-in
A. Option A
B. Option B
C. Option C
D. Option D
E. Option E
TREATMENT OPTIONS
Lead-in
A. Option A
B. Option B
C. Option C
D. Option D
E. Option E
Items can be written to test each step on the shared vignettes

First part of Case Cluster:

A 50-year-old woman comes to your office for a first visit. Se was referred to you by her primary care physician, who said she was concerned about her patient's mood and self-reported performance at work. The patient appears well dressed but somewhat distracted at her appointment. Upon questioning, she says that she has felt somewhat depressed for about 4 months, since her youngest son was killed in an automobile accident, and she ahs not slept or eaten well for several weeks. She says that she feels unable to concentrate at work, although her coworkers have been sympathetic and cut her slack. : I don't deserve to be treated well," she says tearfully. "How could I let this happen?" The patient denies suicidal ideation.

1. The MOST appropriate diagnosis at this time is
   - A. major depression, single episode
   - B. major depression, chronic
   - C. benzodiazepine dependence
   - D. adjustment disorder, depressive type*
   - E. bipolar disorder, depressive episode

2. The MOST appropriate intervention at this time is
   - A. lithium administration
   - B. electroconvulsive therapy (ECT)
   - C. flouxetine administration
   - D. short-term supportive psychotherapy*
   - E. hospitalization for benzodiazepine taper

Second part of Case Cluster:

The patient undergoes treatment, with some improvement. However, 6 months later, at a regularly scheduled appointment, she reveals that she has begun to think of ways to kill herself. "Nothing's going well." She reports, although she has just finished telling you that she was recently promoted at work and has regained her appetite.

3. The MOST appropriate diagnosis at this time is
   - A. major depression, single episode*
   - B. schizophrenia, paranoid type
   - C. benzodiazepine dependence
   - D. adjustment disorder, depressive type
   - E. bipolar disorder, depressive episode

2. The MOST appropriate intervention at this time is
   - A. immediate hospitalization for suicidality
   - B. flouxetine administration
   - C. electroconvulsive therapy (ECT)
   - D. haloperidol administration
   - E. assessment of nature and magnitude of suicidal ideation*

A 65-year-old woman presents to the physician's office for her yearly physical examination. She has no complaints except for a recent 10-pound weight loss. Past history is pertinent for a 40-pack-year smoking history, hypertension, asthma, and hypothyroidism. Examination reveals a thin woman with normal vital signs and unremarkable heart and abdominal exams. A Lung exam reveals mild wheezing and a few bibasilar rales. A chest x-ray is obtained and is shown in figure 4-13. A chest x-ray obtained 3 years ago was normal. Yearly laboratory tests including a complete blood count (CBC), electrolytes, and lipid panels are normal.

Figure 4–13. Posteroanterior chest x-ray. *(Reprinted with permission from Niederhuber JE. Fundamentals of Surgery. Appleton & Lange, 1998.)*

1. Which of the following is the most likely diagnoses?

   A. small lung cancer
   B. tuberculosis
   C. Non-small lung cancer
   D. hamartoma
   E. abscess

2. Which of the following is the most next diagnostic test?

   A. percutaneous needle biopsy
   B. CT scan
   C. pulmonary function tests
   D. mediastinoscopsy
   E. bronchoscopsy

Scenario 2

You are the F1 doctor on the Medical Assessment Unit and are reviewing a father and his two children who present with worsening headaches, myalgia and lethargy. The two children have also complained of stomach aches. This problem has been present for the past week and has been getting gradually worse. The children's mother, who also suffers from headaches, has been visiting a distant aunt over the last week and has been feeling better away from home.

There is no past medical history of note but the father is unsure of whether the children have had all their childhood immunisations. On examination the father is comfortable at rest, with a pulse of 90 bpm, blood pressure 115/78 mmHg, a respiratory rate of 25 per minute, oxygen saturations of 100% on room air and a clear chest, with no cardiac murmurs.

S2.1 Which ONE of the following is the most likely diagnosis?

- ○ A Unintentional poisoning
- ○ B Influenza
- ○ C Non-specific viral infection
- ○ D Family difficulties
- ○ E Encephalitis

S2.2 Which ONE of the following is the most appropriate?

- ○ A Viral swabs and serology
- ○ B Referral to the on-call social services team
- ○ C Reassure and discharge
- ○ D Chest X-ray
- ○ E Commence oxygen therapy

Pick “N” Questions

Theme: ORDERING A SET OF DIAGNOSTIC STUDIES

(A) Cervical Culture for *Neisseria gonorrhoeae*
(B) Cervical testing for *Chalmydia trachomatis*
(C) Complete blood count
(D) CT scan for the abdomen
(E) CT scan for the pelvis
(F) Measurement of blood pressure while sitting and supine
(G) Measurement of serum aspartate aminotransferase (AST, GOT) activity
(H) Pregnancy test
(I) Screening blood group and Rh factor
(J) Ultrasonography of the pelvis
(K) Urianalysis
(L) X-ray film of the abdomen

For each patient with abdominal pain, select the most appropriate diagnostic studies

A 24-year-old woman comes to the emergency department because of the sudden onset of pain in the left lower quadrant of the abdomen followed by nausea and syncope; the pain began one hour ago. She is conscious but feels lightheaded and has pain in her left shoulder. Her last menstrual period was two months ago. The abdomen is moderately tender to deep palpation. Pelvic examination shows generalized tenderness, greater on the left side than the right.
(SELECT 5 STUDIES)

A 4 day old boy born to consanguineous Asian parents was brought to the emergency department with left sided focal fits. The fits stopped after giving rectal diazepam. On examination his temperature was 38°C, heart rate 140/minute and respiratory rate 40/minute.

He was drowsy post diazepam but rousable. The rest of the physical examination was normal.

13. Apart from a septic screen, including a lumbar puncture, which two of the following investigations would be most helpful in his immediate management? (4 marks)

SELECT TWO ANSWERS ONLY

A ammonia

B blood sugar

C calcium

D coagulation screen

E cranial ultrasound

F CT head scan

G full blood count

H urea and electrolytes

Study: Parent initiated prednisolone for acute asthma in children of school age.

Objective: To study the effect of oral prednisolone on acute asthma symptoms in children aged 5-12 years.

Design: Double Blind Randomised Placebo controlled cross-over trial.

Outcome: Daytime asthma symptom score, night-time symptom score and school absenteeism.

Results: 230 children followed up over 3 years. 131 participants contributed, 308 episodes asthma requiring treatment. 155 episodes were treated with prednisolone, 153 with placebo. Mean daytime score with prednisolone treatment was 15% lower (95% confidence intervals (C.I.) 2-26%). Mean night-time score treated with prednisolone 16% lower (95% C.I. 0-30%). School absenteeism was reduced by a mean of 0.4 days (95% C.I. 0.0-0.8 days).
Adapted from BMJ 2010 vol 340, page 518-19)

Which of the following conclusions can be reached from the information presented above? (6 marks)

SELECT TWO ANSWERS ONLY

A Acute asthma substantially affects school attendance.

B Parents of all children with asthma should be given a supply of prednisolone.

C Parents of children with asthma aged 5-12 years should not be given prednisolone to deliver at home.

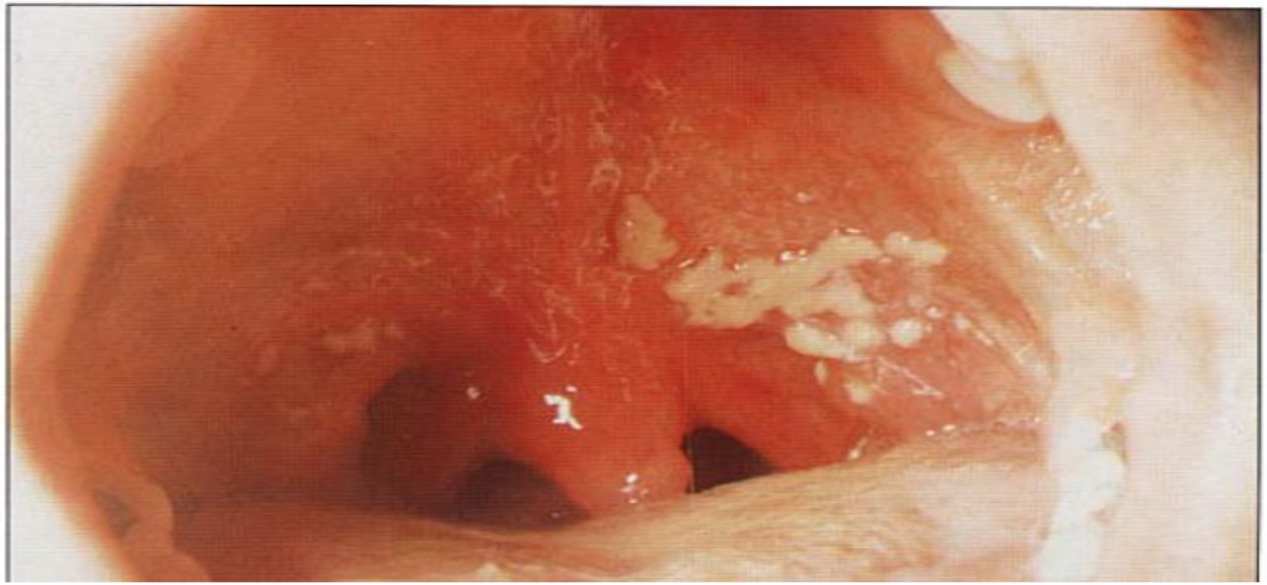
D Prednisolone does not significantly reduce night-time symptoms in asthma.

E Prednisolone significantly reduces daytime symptom score in acute asthma.

F The results are invalid as only 57% children received intervention

Questions 18 and 19

This 16 year old girl presented with a sore throat.



18. What is the lesion on the soft palate? (3 marks)

SELECT <u>ONE</u> ANSWER ONLY

A drug reaction

B Ebstein-Barr virus infection

C Herpes simplex infection

D oral Candidiasis

E Staphylococcal infection

F Streptococcal infection

19. Give three possible predisposing factors. (3 marks)

SELECT THREE ANSWERS ONLY

A anti-fungal therapy

B chemotherapy

C Chlamydia infection

D cow's milk allergy

E Cytomegalovirus infection

F gastro-oesophageal reflux

G HIV infection

H inhaled corticosteroid therapy

I vitamin D deficiency

J zinc deficiency

51. Select the three most likely causes for the appearance of this 4 year old boy. (3 marks)

SELECT <u>THREE</u> ANSWERS ONLY

A acute nephritis

B bilateral ethmoid sinusitis

C bilateral periorbital cellulitis

D cardiac failure

E cavernous sinus thrombosis

F congenital angio-oedema

G Henoch-Schönlein purpura

H myotonia

I nephrotic syndrome

J non-accidental injury

K superior vena cava obstruction

L water intoxication

Getting Started

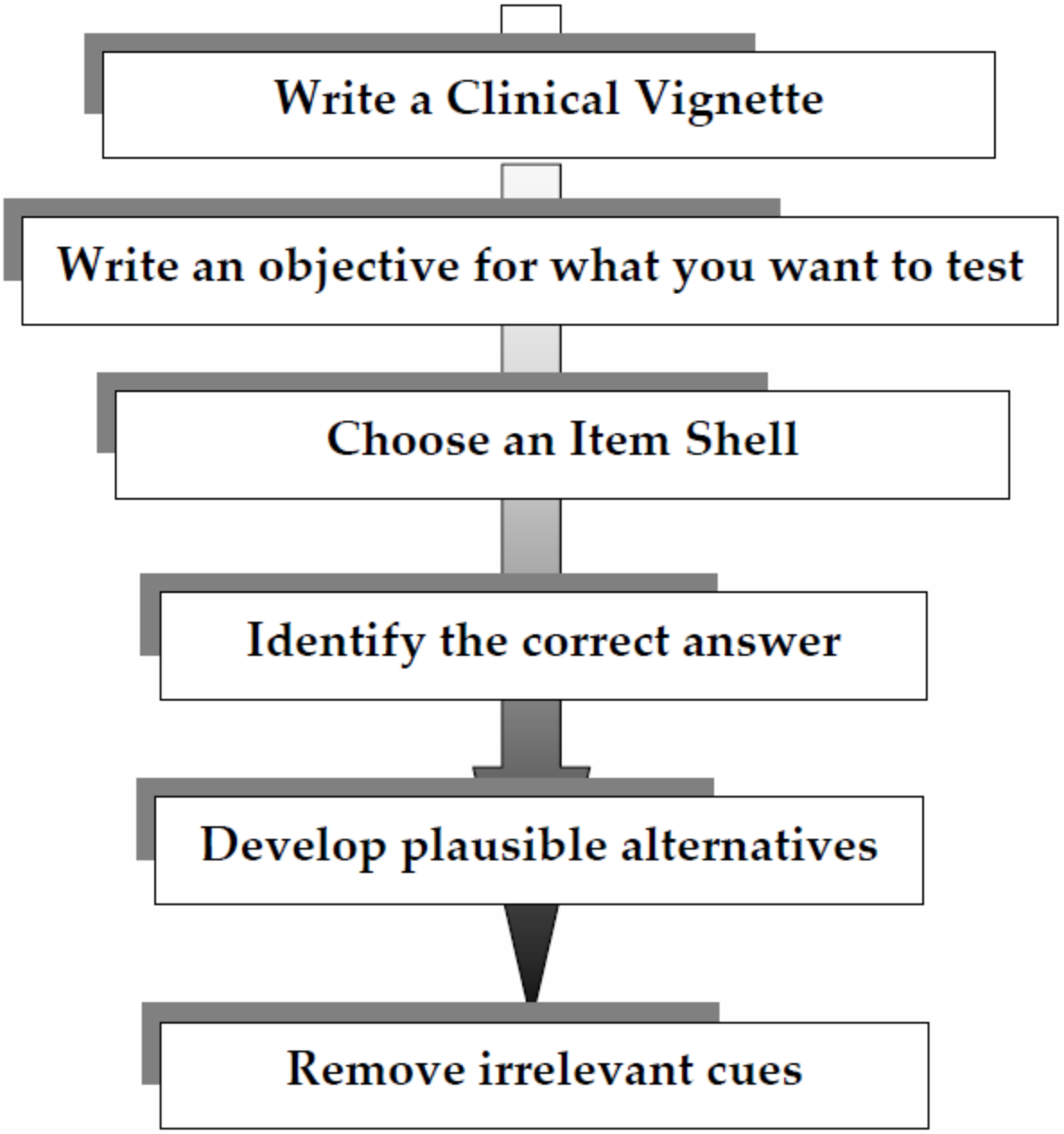
1) Getting started in item writing is always difficult. Here are some useful tips.
2) Always work in Pairs or Groups.
3) Use the samples provided to guide your writing.
4) Use any existing items you can obtain, including items in textbooks and the like.
5) Always write your topic and learning objective first.
6) Even if your question does not sound right, don't discard it just yet. You can make it better by revising it using the item writing rules provided.
7) Always Review

How to Write Case-based Questions

Steps in Writing a Good MCQ

The steps in writing a good MCQ are outlined below:

1. *Write an authentic case that described a real clinical event*
2. *Focus on a single topic and an important learning outcome*
3. *Formulate a clearly stated problem.*
4. *Identify the keyed response (correct answer)*
5. *Identify a number of plausible alternatives*
6. *In developing alternatives use student common errors, misconceptions, answers from wrong working and answers from inaccuracies.*
7. *Use a checklist to remove any irrelevant cues.*

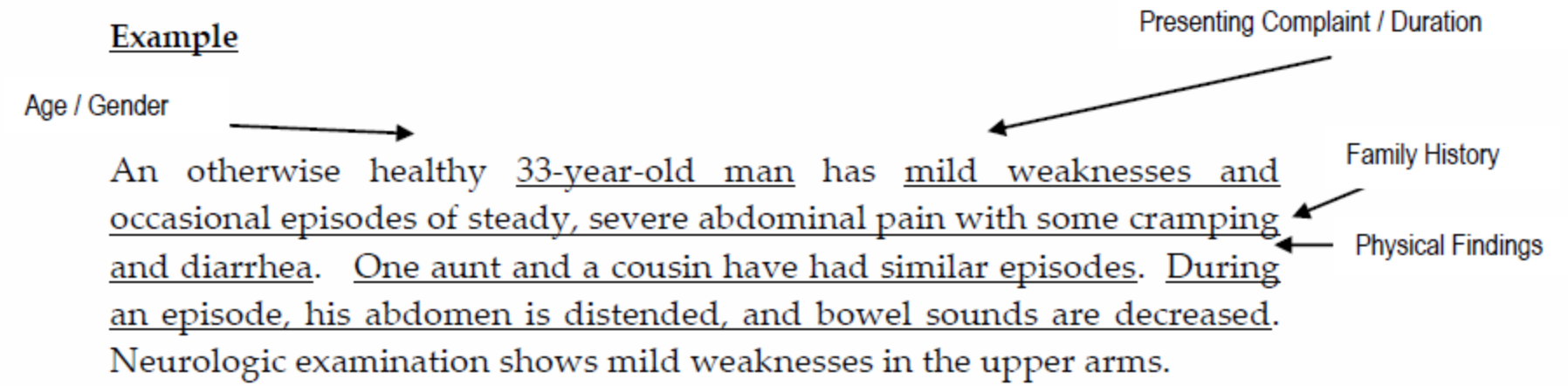

Write a Clinical Vignette
Write an objective for what you want to test
Choose an Item Shell
Identify the correct answer
Develop plausible alternatives
Remove irrelevant cues

How to Write a Clinical Vignette

Patient vignette structure

- Age, Gender
- Site of Care
- Presenting Complaint
- Duration
- Patient History (with Family History)
- Physical Findings
- +/- Results of Diagnostic Studies
- +/- Initial Treatment, Subsequent Findings

Example



An otherwise healthy 33-year-old man has mild weaknesses and occasional episodes of steady, severe abdominal pain with some cramping and diarrhea. One aunt and a cousin have had similar episodes. During an episode, his abdomen is distended, and bowel sounds are decreased. Neurologic examination shows mild weaknesses in the upper arms.

MCQ Questions at Different Levels of Cognition (Mc Guire, 1968)

LEVEL 1 (RECOGNIZE & RECALL ISOLATED INFORMATION)

Which of the following statements about Schizophrenia is true?

Occurs twice as frequently in men as women.
Is usually mild when treated.
Has a peak age of onset of 15-25 years in a male.
Has a good long-term prognosis when treated.
Results in 25% of all suicides.

LEVEL 2: (USING, EXTRAPOLATING, & TRANSFORMING DATA)

A 25-year-old woman woke up one morning and noted that the left side of her face seemed 'paralyzed'. She also observed that she could not sense the taste of food on the left side of her tongue. When she arrived in the clinic of her family doctor, paralysis of the frontalis, orbicularis occuli, orbicularis oris, and platysma muscles on the left side were confirmed.

Select the affected Neural Structure:

A. Abducens nerve
B. Accessory nerve
C. Corticobulbar tract
D. Corticospinal tract
E. Facial nerve
F. Glysopharyngeal nerve
G. Hypolossal nerve
H. Oculomotor nerve
I. Trigeminal nerve
J. Vagus nerve
K. Vestbulocochlear nerve

LEVEL 3: (ANALYZE PROBLEM. RECALL RELEVANT INFORMATION & PRINCIPLES, & APPLY THE INFORMATION AND PRINCIPLES TO THE SOLUTION OF A SPECIFIC PROBLEM

An 8-week-old girl presented with diarrhoea, pneumonia, skin rash, and buccal thrush. Weight <3rd percentile, polymorphic skin rash, palpable spleen. X-ray of chest-interstitial pneumonia-left lung. Leucocyte count 1800/mm, lymphocytes 8%.

Select the most likely diagnosis

A. antibody deficiency
B. cell-mediated immunity disorder
C. complement defect
D. lysozyme deficiency
E. phagocytic defect
F. secretary component deficiency

Increasing the difficulty of a question

Choosing Item Shells/ Cognitive Levels/Content

Lower order Cognitive Skills

Defining Concepts

What is the best definition of . . . ?

A. Definition of concept
B. Plausible non definition
C. Plausible non definition
D. Plausible non definition
E. Plausible non definition

What is the meaning of . . . . ?

Which of the following is synonymous with . . . ?

Which of the following is the correct definition for . . . ?

Which of the following is like . . . ?

Which are the characteristics of . . . ?

Which of the following is an example of . . . ?

Which of the following distinguishes . . . ?

Defining Principles

Which is the best definition of . . . ?

A. Definition of principle
B. Plausible non definition
C. Plausible non definition
D. Plausible non definition
E. Plausible non definition

What is the principle of . . . . ?

Which of the following is the reason for . . . ?

Which of the following is the cause of . . . ?

What is the relationship between . . . and . . . ?

Which of the following is an example of the principle of . . . ?

Predicting Principles

What would happen if . . . ?

A. Correct prediction
B. Plausible non prediction
C. Plausible non prediction
D. Plausible non prediction
E. Plausible non prediction

If . . . what is likely to happen ?

What is the consequence of . . . ?

What is the cause of . . . ?

Applying Concepts, Principles, & Procedures

Which is the best way to . . . ?

A. Targeted procedure
B. Plausible option 1
C. Plausible option 2
D. Plausible option 3
E. Plausible option 4

How should one . . . ?

Evaluating Facts & Concepts

What is the most or least important, significant, effective . . . ?

A. Most or least important, significant, effective
B. Plausible option 1
C. Plausible option 2
D. Plausible option 3
E. Plausible option 4

What is the consequence of . . . ?

Which is the cause of . . . ?

Evaluating Principles

Which of the following principles best applies to . . . ?

A. Targeted event
B. Plausible option 1
C. Plausible option 2
D. Plausible option 3
E. Plausible option 4

Evaluating Procedures

Which of the following procedures best applies to . . . ?

A. Targeted event
B. Plausible option 1
C. Plausible option 2
D. Plausible option 3
E. Plausible option 4

Defining

What are the main symptoms of . . . ?

A. Correct symptom
B. Plausible non symptom
C. Plausible non symptom
D. Plausible non symptom
E. Plausible non symptom

Predicting

Which is the most common (cause, or symptom) of a (patient problem)?

A. Correct cause or symptom
B. Plausible option 1
C. Plausible option 2
D. Plausible option 3
E. Plausible option 4

Evaluating

Diagnosis of patient illness

Which treatment is likely to be most effective?

A. Correct reason or treatment option
B. Plausible option 1
C. Plausible option 2
D. Plausible option 3
E. Plausible option 4

Applying

Information about patient problem

How should the patient be treated?

A. Correct diagnosis/correct treatment protocol
B. Plausible option 1
C. Plausible option 2
D. Plausible option 3
E. Plausible option 4

Code	System	MCQ	KFP (2 TO 4 PARTS)
GI	GIT: Vomiting, Diarrhoea, Constipation, Abdominal pain, Rectal bleeding, Jaundice, Hepatitis. Nutrition: Normal Nutrition, Nutritional Problems: Failure to thrive, Severe childhood malnutrition, micronutrient deficiencies	11	3
RS	Respiratory System: Cough, Cold, & Sore throat, Epiglottitis, Croup Ear infections, Nasal Obstruction, Nose bleed, Asthma, Pneumonia, Bronchiolitis/ Immunology and Allergy: Eczema, Dermatitis, Rhinitis	11	3
NE	Fetal/Neonatal: Asphyxia, Cyanosis, Respiratory Distress, Jaundice Sepsis, Pre-term	10	2
ID	Infections / Immunization / HIV: Fever, Meningitis, HIV/AIDS/TB, Viral, bacterial and parasitic infection, Syphillis, Dengue, Immunization	12	2
CN	Behavior & Development: Milestones, Enuresis, Autism, ADHD Problems at School, Sleep Disorder	5	2
CN	Neurology: Cerebral Palsy, Disorders of gait, Headache, Convulsions Muscle diseases, Hearing & Visual defects	11	2
CV	C.V.S.: Congenital Heart, Heart Failure, Rhumatic Heart, Kawasaki	11	2
RN	Nephrology: Haematuria, Proteinuria, Urinary infections, Swelling of face & ankle, Dysuria	11	2
HO	Haem/Oncology: Anaemia, Hbopathy, Other anaemias, Bruising/purpura, Acute leukemia, Solid Tumors	7	2
EN	Endocrine / Growth: Diabetes, Hypoglycemia, Hypo- & Hyper-thyroidism, Growth disorders, Growth charts; Growth Monitoring	10	2
MS	Miscellaneous: Skin infections, Red eye/sticky eye, Dysmorphism, Child Abuse, Adolescent Medicine, Paediatric Orthopaedics, Community Paediatrics	7	2
MS	Rheumatology: Joint pains – acute & chronic, Rheumatoid arthritis, SLE, Other Collagen Vascular Disease.	2	1
MS	Basic Science, Stat, Ethics	3	0-1
MS	Acutely Ill Child: Anaphylaxis, Shock, Unconscious, Poisoning Foreign body: ingestion/ inhalation, burns	7	1
TH	Therapeutics	4	1
	Total	**122**	**24- 28**

Clinical Decision-Making

* **Suggested Steps of Action for Decision Making Process**

* **Assessment, or Gathering information**
  * Most decisions require collecting pertinent information including history taking, clinical examination and relevant preliminary investigations
* **Diagnosis, or Interpreting the information**
  * Through the process of collecting information you will probably identify several possible alternatives or differential diagnoses, thus listing all possible alternatives.
* **Planning, or Developing the care plan**
  * Weigh all the available evidence and select the most likely alternative, considering treatment thresholds by assessing the risks and benefits of alternative interventions, and decide on a treatment plan
* **Intervention, or Implementing the care plan**
  * Implement the plan.
* **Evaluation, or Evaluating the care plan**
  * Evaluate whether or not the plan resulted in the desired outcome. Also look for any new clinical development and whether other investigations are needed at this stage.

Combination Vignette & Shells

Samples

A (patient description) has a (type of injury and location).

Which of the following structures is likely to be most affected?

A.
B.
C.
D.
E.

A (patient description) has (symptoms and signs).

These observations suggest that the disease is a result of the (absence or presence) of which of the following (enzymes, mechanisms)?

A.
B.
C.
D.
E.

A (patient description) has (history findings) and is taking (medications).

Which ONE of the following medications is the most likely cause of his (history, PE, or lab findings?

A.
B.
C.
D.
E.

A (patient description) follows a (specific dietary regime).

Which of the following conditions is most likely to occur?

A.
B.
C.
D.
E.

A (patient description) has (abnormal findings).

Which [additional] finding would suggest/suggests a diagnosis of (disease 1) rather than (disease 2)?

A.
B.
C.
D.
E.

A (patient description) has (symptoms, signs, or specific disease) and is being treated with (drug or drug class).

The drug acts by inhibiting which of the following (functions, processes)?

A.
B.
C.
D.
E.

A (patient description) has (abnormal findings).

Which of the following (positive laboratory results) would be expected

A.
B.
C.
D.
E.

A (patient description) dies of (disease).

Which of the following is the most likely autopsy?

A.
B.
C.
D.
E.

(Time period) after (event such as a trip or meal with certain foods, a (patient or group description) became ill with (symptoms and signs).

Which of the following (organisms, agents) is most likely to be found on analysis of (food?

A.
B.
C.
D.
E.

A patient has (symptoms and signs).

Which of the following conditions is the most likely explanation for the (findings)?

A.
B.
C.
D.
E.

Following (procedure), a (patient description) develops (symptoms and signs). Laboratory findings show (findings).

Which of the following is the most likely cause?

A.
B.
C.
D.
E.

A (patient description) has (symptoms and signs)

Exposure to which of the (toxic agents) is the most likely cause?

A.
B.
C.
D.
E.

Which of the following is the most likely mechanism of the therapeutic effect of this (drug class) in patients with (disease)?

A.
B.
C.
D.
E.

A patient has (abnormal findings), but (normal findings).

Which of the following is the most likely diagnosis?

A.
B.
C.
D.
E.

Which of the following is (abnormal)?
Sites of legion
List of nerves
List of muscles
List of enzymes
List of hormones
Types of cells
List of neurotransmitters
List of toxins, molecules, vessels, and spinals segments

Which of the following findings is most likely?
Sites of laboratory results
List of additional physical signs
List of autopsy results
Results of microscopic examination of fluids, muscle or joint tissue
DNA analysis results
Serum levels

Which of the following is the most likely cause?
Underlying mechanisms of disease
Medication that might cause side effects
Drugs or drug classes
Toxic agents
Haemodynamic mechanisms
Viruses
Metabolic defects

Which of the following should be administered?
Drugs
Vitamins
Amino acids
Enzymes
Hormones

Which of the following is defective/deficient/non functioning?
List of enzymes
Feedback mechanisms
Endocrine structures
Dietary elements
Vitamins

Writing items from textbooks

Identify the stem of a successfully performing item

A 6-year child is brought to the hospital with contusions over the abdomen and chest as a result of an automobile accident.

What should be the initial treatment?

Underline key words or phrases representing the content of the item.

A 6-year child is brought to the hospital with contusions over the abdomen and chest as a result of an automobile accident.

What should be the initial treatment?

Identify variations for each key word or phrase.

Age of Person

infant, child (ages 3-4)Adolescent (ages 3-8), young adult (ages 9-3), middle age (ages 32-59, elderly (ages 60 and over).

Trauma Injury & Complications

Cuts, confusions, fractures, internal injuries.

Types of accident

Automobile, home, industrial, recreational

Select an age, trauma injury or complication, and type of accident from personal experience.

Write the Stem.

An infant is brought to the hospital with severe abrasions following a bicycle accident involving the mother.

What should be the initial treatment?

Write the correct answer.

Write the required number of distractors, or as many plausible distractors as you can with a limit of four

A. **Conduct a visual examination.***
B. Treat for infection
C. Administer pain killers to clam the infant
D. Send for laboratory tests
E. Clean the wounds with an antiseptic

Using item Modelling

Facet Dimensions Governing Content of Item

Facet One: Setting of the patient encounter

1. Unscheduled patients/clinical visits
2. Scheduled appointments
3. Hospital rounds
4. Emergency department
5. Other encounters

Facet Two: Physician tasks in the patient encounter

1. To obtain history and perform physical examination
2. To use laboratory and diagnostic studies
3. To formulate the most likely diagnosis
4. To evaluate the severity of the patients(s) problems
5. To manage the patient
6. To apply scientific concepts
7. Other encounters

Facet Three: Types of patient encounters (case clusters)

1. Initial workup of new patient, new problem
2. Initial workup of known patient, new problem
3. Continued care of known patient, old problem
4. Continued dare of known patient, worsening old problem
5. Emergency care

Write Vignette

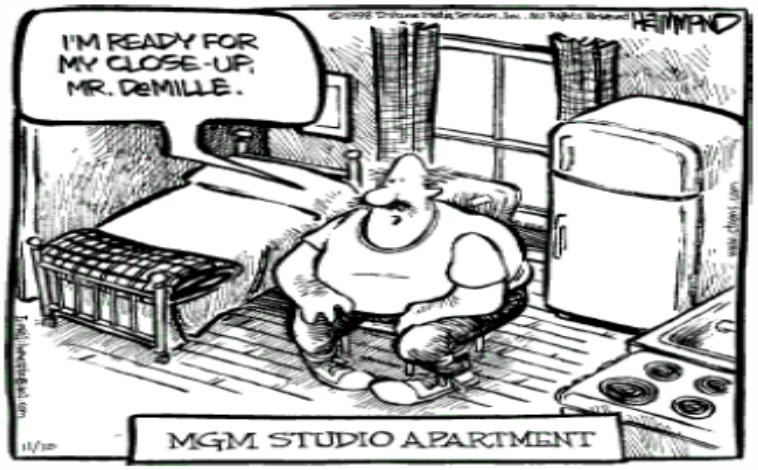
A 19-year-old archeology student comes to the student health service complaining of severe diarrhea, with 15 large-volume watery stools per day for 2 days. She has no vomiting, hematocheza, chills, or fever, but she is very weak and very thirsty. She is just returned from a two-week trip to a remote Central American archeological research site. Physical examination shows a temperature of 37.2 degrees Centigrade, pulse 120/min, respirations 12/min and blood pressure 90/50 mm Hg. Her lips are dry and skin turgor is poor. **What is the most likely cause of the diarrhea?**

Setting 2
Physician Task 3
Case Cluster 1

Question Review

Types of Item Review

There are a number of reviews that should be conducted prior to test administration. These are listed below.



- Review of Item Writing Rules
- Editorial Review
- Key Check
- Content Check
- Bias Review
- Test-taker Review

Content concerns

1. Every item should reflect specific content and a single specific mental behavior, as called for in test specifications (two-way grid, test blueprint).
2. Base each item on important content to learn; avoid trivial content.
3. Use novel material to test higher level learning. Paraphrase textbook language or language used during instruction when used in a test item to avoid testing for simply recall.
4. Keep the content of each item independent from content of other items on the test.
5. Avoid over specific and over general content when writing MC items.
6. Avoid opinion-based items.
7. Avoid trick items.
8. Keep vocabulary simple for the group of students being tested.

Formatting concerns

9. Use the question, completion, and best answer versions of the conventional MC, the alternate choice, true-false (TF), multiple true-false (MTF), matching, and the context-dependent item and item set formats, but AVOID the complex MC (Type K) format.
10. Format the item vertically instead of horizontally.

Style concerns

11. Edit and proof items.
12. Use correct grammar, punctuation, capitalization, and spelling.
13. Minimize the amount of reading in each item.

Writing the stem

14. Ensure that the directions in the stem are very clear.
15. Include the central idea in the stem instead of the choices.
16. Avoid window dressing (excessive verbiage).
17. Word the stem positively, avoid negatives such as NOT or EXCEPT. If negative words are used, use the word cautiously and always ensure that the word appears capitalized and boldface.

Writing the choices

18. Develop as many effective choices as you can, but research suggests three is adequate.
19. Make sure that only one of these choices is the right answer.
20. Vary the location of the right answer according to the number of choices.
21. Place choices in logical or numerical order.
22. Keep choices independent; choices should not be overlapping.
23. Keep choices homogeneous in content and grammatical structure.
24. Keep the length of choices about equal.
25. *None-of-the-above* should be used carefully.
26. Avoid *All-of-the-above*.
27. Phrase choices positively; avoid negatives such as NOT.
28. Avoid giving clues to the right answer, such as
    a. Specific determiners including always, never, completely, and absolutely.
    b. Clang associations, choices identical to or resembling words in the stem.
    c. Grammatical inconsistencies that cue the test-taker to the correct choice.
    d. Conspicuous correct choice.
    e. Pairs or triplets of options that clue the test-taker to the correct choice.
    f. Blatantly absurd, ridiculous options.
29. Make all distractors plausible.
30. Use typical errors of students to write your distractors.
31. Use humor if it is compatible with the teacher and the learning environment.