IEHMS Guide to Question Writing for the Healthcare Programmes

Introduction

We hope this guide will be helpful to you; please circulate it to colleagues and junior staff and encourage them to get involved in question writing.

Who is this guide for?

Staff who design or deliver teaching in Healthcare Programmes that use SBA question as part of their programme of assessments.

Aims and Outcomes of this guide

The aim is to help you prepare questions for written assessments.

Once you have read this guide, you should be able to meet the following outcomes:

Describe the following question formats

- Single best answer question (SBA)
- Very short answer question (VSAQ)
- Short answer question (SAQ)

Know the principles of question construction

Recognise the 'house style' used locally

Be aware of other useful resources

….and have written a question or two!

Is there a need for more questions?

Simply put, yes. All the question banks have some topics with very few questions, and some questions are dated. In order that students are fully prepared to enter the next year, it is important that the written assessments cover the full breadth of teaching.

Single Best Answer (SBA) Questions

Single best answer (SBA) items include:

Stem or vignette, describing the problem.

Lead-in which asks a specific question

Five options, all of which are plausible, but with one clearly better than the others.

Why use Single Best Answer Questions?

Contemporary educational theory suggests that SBA questions are well suited to the assessment of those aspects of knowledge essential for clinical practice, including application of knowledge, data interpretation, problem solving and decision making.
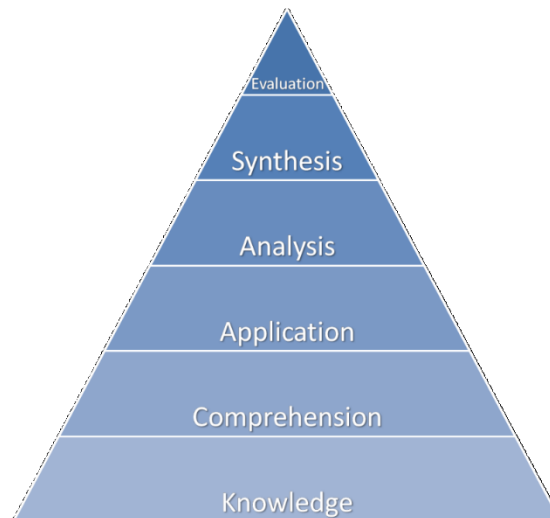
Bloom's Taxonomy of Educational Objectives

Writing good quality SBA questions

What SBAs do we want?

• Each item should focus on an important concept, typically a common and/or important clinical problem. Start with the learning outcomes – we should be testing students in what they are expected to know.

• Think about all the areas of clinical practice – investigations, management, risk factors, side effects of treatments, ethical or legal issues, advice to patients, how basic science applies to clinical assessment.

• Encourage the student to problem solve, testing how to apply knowledge to the problem – they may have to work out the diagnosis from the information given to decide the best management etc.

What we don't want:

• We don't want questions about esoteric facts.

• We don't want questions that are multiple true false items with only one right answer, or statements of fact without any clinical or science-based setting.

• We don't want questions with a negative lead in such as 'least likely', 'treatment you would not give'.

A well-constructed SBA question includes four components:

A theme: this is the lecture or learning outcome to which the question refers. Please note which learning outcome the question refers to. The item title should be as specific as

possible and can be anything from for example 'treatment of chest pain' to 'interpreting lab results for anaemia'.

A stem or vignette; describing the problem. The clinical or science-based vignette should be concise and focussed. For a clinical vignette, give the patient history, observations, signs, investigations etc. in a logical order. For the basic sciences, patient vignettes may be brief but having a clinical context increases the face validity of the assessment; laboratory vignettes are also appropriate.

A lead-in: this must pose a clear question. Ideally candidates should be able to deduce the answer before reviewing the options (the cover test). For example, 'Which is the most likely diagnosis?' or 'Which is the best initial step in management?'

Five Options, one of which is the **best** answer. Avoid lists of options that are too complicated or deliberately misleading. Order the options in logical order e.g., alphabetical, numerical or anatomical order.

The options should be:

- o Plausible – try to avoid obviously redundant answers
- o Homogeneous – e.g., all diagnoses, all treatments
- o Grammatically correct – don't mix tenses etc.
- o Roughly the same length – so the right answer doesn't stand out

Make sure that:

- o There is only one best answer and that answer is on the list.
- o The BEST answer is evidence based and widely agreed upon by experts (e.g., SIGN/NICE guidelines)

Who might contribute to high quality question writing?

• Your colleagues

• Question writing groups

• Written paper coordinator or Year Lead

• Specialty leads

• Examiners in standard setting group

• External examiners who may request changes

Example SBA 1

Theme: Hormones in pregnancy and labour

Stem: A 28 year old woman has an uncomplicated normal vaginal delivery. In the immediate post-partum period, her breasts start to ooze a thick liquid, slightly yellow in colour.

Lead-in: Which hormone is most likely to be responsible for the appearance of this liquid?

Options:

    A. Oestradiol
    B. Oestrogen
    C. Oxytocin
    D. Progesterone
    E. Prolactin

Correct Answer: E

Pitfalls and further tips in SBA construction

• Avoid stems that include bad practice or errors.

• Avoid abbreviations and give normal ranges for results.

• A two-step question where the candidate must first decide on the likely diagnosis prior to answering the lead-in about treatment etc. is more challenging.

• All 'distractors' (incorrect options) should be homogeneous. They should fall into the same category as the correct answer (e.g., all diagnoses, investigations, treatments, management options, enzymes, organisms, physical properties).

• Avoid using "double options" (e.g., do W and X; do Y because of Z) unless all options are double options.

• Avoid using frequency terms (often, rarely, commonly etc.) as these terms are vague and there is seldom agreement on their meaning.

• Avoid using absolute terms (always, never, only, all) in your options. These are easy to eliminate as candidates will be aware that there are often no absolute truths in healthcare.

• Avoid repeating the same words in the stem and the correct option. Similar wording allows the candidate to select the correct option without knowing the material.

• Showing a colleague your question can significantly improve its value.

• See Appendix: House Style for SBAs

Example SBA 2

Which joint disease is commonly associated with morning stiffness that improves with activity?

A) Ankylosing spondylitis

B) Gout

C) Osteoarthritis

D) Psoriatic arthritis

E) Rheumatoid arthritis

Why is this a poor-quality question?

It is in a multiple-choice format rather than single best answer format. There is no clinical vignette or background information. Additionally, morning stiffness is seen in rheumatoid arthritis, psoriatic arthritis and ankylosing spondylitis.

Example 2 reworked

A 51 year old woman has pain and stiffness of the joints in her hands in the morning, lasting around 40 minutes. Her pain often improves with some light activity. She has had the pain and stiffness for five weeks.

Which is the most likely diagnosis in this patient?

A) Ankylosing spondylitis

B) Gout

C) Osteoarthritis

D) Psoriatic arthritis

E) Rheumatoid arthritis

Correct answer: E) Rheumatoid arthritis

Rationale: All the conditions cause joint pain. Ankylosing spondylitis, psoriatic arthritis, and rheumatoid arthritis are associated with morning stiffness. Ankylosing spondylitis is known to affect the spine, can affect hips and knees. There is no known history of psoriasis in this patient. Gout and osteoarthritis are less likely to be symmetrical in presentation and would not present with morning stiffness. Rheumatoid arthritis is the most likely answer.

Review checklist for SBAs

The theme is pitched at an appropriate level for the intended year group	
The question focuses on an important problem relevant to clinical practice	
The question can be answered without looking at the options	
There is a single best answer to the item / vignette	
The answer is correct, and evidence based	
The option list is consistent and does not mix different skill areas	
Most options are plausible answers for the stem / vignette	
The lead in is specific and explicit	
There are no 'cues' that give away the answer	
The title is appropriate and accurately reflects the content of all the question	
Only essential information is included	
The question can be read and answered in approximately one minute	
The whole question adheres to house style	

Tagging SBA questions

Theme / overview of SBA item	**One skill, one presentation** e.g., diagnosis of abdominal pain
Tags per item	You can select more than one tag for each domain, but please select one primary tag for each of the domains in bold: **Year group**: Year 1, Year 2, Year 3 or Year 4 **Type of question**: Formative or Summative **MLA Area of clinical practice*** Who would be looking after the patient? Essentially specialty For GP questions add Care Setting > Primary Care &/OR **MLA Area of applied knowledge*** **Supplementary area of clinical practice** e.g., Acute medicine, surgery, clinical imaging **Condition (MLA).** Relates to presenting symptom **Patient presentation (MLA)** **Skill**. Usually defined by lead-in for most items e.g., diagnosis, investigation, management, treatment or appropriate description

* System/specialty for PA programme

Cloning SBA questions and Variants

Cloning - Two-step questions

A two-step question where the candidate has to first decide on the likely diagnosis prior to answering the lead-in about treatment, investigation, imaging, etc. Cloned items will appear similar to original question.

Example SBA 3- hypothyroidism

A 32 year old woman has unexplained weight gain and lethargy over the last 12 months. She has also noticed hair loss. She has dry skin and and delayed relaxation phase of reflexes.

Original question:

> Which is the most likely diagnosis in this patient?

Example alternative questions:

> Which is the most appropriate treatment?
> Which thyroid function test results are you most likely to find in this condition?

Variants - changing the scenario

Variable	
Age	Adult 18-70 years old
Gender	Man or woman 1:3
Presenting complaint	Fatigue/exhaustion
	Needing to sleep more than previously
	Unexplained weight gain
	Dry skin
	Increased sensitivity to cold
	Slowness of thinking
	Muscle weakness
Other complaints	Thinning hair
	Needing to sleep more than previously
	Forgetfulness / impaired memory
	Family history of thyroid or autoimmune disease
	Irregular menstruation and/or heavier menstruation
	Puffy face
	Hoarseness
	Muscle aches, tenderness and stiffness
	Thyroid enlargement / goitre
	Decreased libido, erectile dysfunction
Examination findings	Dry skin
	Coarse hair

	Bradycardia
	Delayed relaxation phase of reflexes
	Periorbital oedema
	No thyroid enlargement
	Thyroid enlargement
Laboratory findings	Thyroid function test results
	Antibodies to thyroid peroxidase
	Elevated cholesterol

Variants do not resemble the original question and are likely to have different psychometrics compared to the original question

Example variant scenarios

A 34 year old woman has unexplained weight gain of 5 Kg over six months with increased sensitivity to cold, even over the summer. She has also noticed that her menstruation has become irregular and heavier. She has dry skin, a firm, non tender goitre and delayed relaxation phase of reflexes.

Which is the most likely diagnosis?

A 44 year old man has weight gain, fatigue, muscle weakness, decreased libido and erectile dysfunction. He has a family history of thyroid disease.

Investigation: Thyroid antibody test - Thyroglobulin antibodies positive

Which is the most likely diagnosis?

A 54 year old woman has gradual weight gain and fatigue, with muscle aches, tenderness and stiffness. Her partner has noticed that her eyes are puffy.

Investigation: Thyroid stimulating hormone (TSH) 11.2 mU/L (0.27-4.2 mU/L)
            Free T4   9.3 pmol/L (12-22pmol/L)
            Free T3   2.9 pmol/L (3.1-6.8pmol/L)

Which is the most likely diagnosis?

Very Short Answer Questions

Very short answer questions (VSAQ) are a type of open-ended question. They include a clinical scenario in the same style as an SBA question (including relevant history, examination findings and investigations) and a lead-in, e.g., what is the most likely diagnosis? but test recall.

VSAQ may be more authentic and have the potential to be a more robust assessment of competency as they remove any cueing or guessing of the correct answer. Cueing provided by SBA questions may help students answer strategically, so that their result might not reflect their true knowledge. Removing the cueing effect will make these questions harder.

With any new type of assessment, it is important that their introduction is evaluated, and we will be introducing some VSAQ into formative assessments only. The rational being that VSAQ more accurately reflect clinical decision making and could be used to test areas that would be considered very easy as an SBA question (facility >90%) or an emergency treatment that candidates should know.

Writing VSAQ

VSAQ questions include:

> Stem or vignette, describing the problem.

- Clinical vignette with relevant history, examination findings and investigations results.
- Identical to style guide for SBA

> Lead-in which asks a specific question

- What is the most likely diagnosis?
- What is the most appropriate investigation?
- What id the most appropriate management?

The VSAQ will be computer marked so the answers should be no more than 4 words in length. Correct answers and acceptable variations (e.g., chest X-ray, chest X ray) will be marked, but he exam coordinator would need to check the incorrect answers for other acceptable variations. These would then be added to the acceptable answers and makes the process quicker when the question is used again.

Short Answer Questions (SAQ)

Short Answer Questions involve a series of concise questions, typically based around a clinical scenario. The case scenario is sequentially revealed to the candidate. Students write their answers in free text, rather than choosing from a list of potential answers. A SAQ format guides the candidate to provide a structured and straightforward response to a question. When given a well-constructed SAQ candidates should understand what is expected of them and how the marks are allocated.

Why use Short Answer Questions?

SAQ, like SBA question formats, can test multiple levels of Bloom's taxonomy, and can test interpretation, problem-solving, clinical reasoning and decision-making ability.

SAQ do not display answers thereby emphasising recall of knowledge rather than recognition. When well written, SAQs can require knowledge to be applied to specific contexts and situations.

Writing good quality SAQ items

The principles are similar to that of SBA construction; start with the learning outcomes. Identify a topic/concept where different aspects can be explored. Think of a clinical or scientific vignette – ideally as authentic and plausible as possible, ensuring that it relates to curricular activity and learning outcomes.

A SAQ is usually introduced with a brief case scenario followed by a short answer style question. Having completed the first question, the candidate then answers supplementary questions relating to the case history, with further clinical information provided as appropriate.

Frame 4-6 questions on specific tasks you want candidates to perform. The questions should be challenging, relevant and lead to a concise defined response. Each question should have a mark allocation for the question and a space where the candidate provides their answer. The wording for each question should be clear and easy to understand (see Appendix House Style for SBAs).

Response options can include any of the following:

> Single words
> Short phrases
> Simple calculations
> Diagrams

Use concise questions worded so that a clear, meaningful problem is presented and candidates know exactly how to answer the question and what key knowledge they need to recall.

Short answer questions require concise answers. Structure the question so that the range of acceptable responses is limited to a single correct answer or a narrow set of definite, clear-cut, and explicit answers. Typically, the questions contain words such as 'list' or 'name' suggesting that a series of short responses are required.

Set the questions explicitly and precisely with clear instructions testing the identified learning outcomes. Ensure that the questions clearly specify how the question should be answered (e.g., list, name, calculate, prescribe) and restrict the responses, e.g., name three preliminary investigations, give one reason for each investigation, list five key steps in management.

Each SAQ is created with a list of anticipated 'model' answers. This model answer is used to guide the markers as to the value of the responses when scoring the question. Assign marks to each component according to its importance. Marks or partial marks are allocated for acceptable answers.

Aim for between 15 and 20 marks per SAQ question.

Pitfalls and further tips for SAQ construction

• Clinical vignettes are a good opportunity to test candidates in a clinically relevant situation and should reflect common practice.

• Don't give the game away! For example, providing hints at the answers to earlier questions in later questions.

• Always include a direction word, directing the candidate how to answer the question. For example, if you ask the candidate to "list three ….." then they know that they should format their response as a numbered list.

• Try to make questions as focussed as possible – this makes them much easier to mark. Not doing so will require acceptance of any answer that could be correct in the broadly defined situation.

• Avoid words that invite lengthy answers like describe, discuss, explain, outline or comment.

• Avoid using 'would' because what a candidate would do may not be what they should do.

• Avoid creating questions where candidates must know the answer to one question in order to answer other questions. Candidates may receive a lower mark if they make a mistake early on but are required to build on their earlier answer.

• Clearly indicate how many marks each question is worth. The number of marks each question is worth gives the candidate an indication of the proportion of time to spend on the question and the rough length of the answer.

• As with SBAs, showing a colleague your question can significantly improve its value.

Example SAQ

A 62 year old man is seen at the medical out-patient clinic with a two year history of gradually worsening heaviness in his chest related to exertion such as walking 500 meters or up a steep slope. His symptoms resolve within two minutes of rest. His GP has initiated treatment but his effort tolerance remains limited. Physical examination and his resting ECG are normal.

1. What is the most likely diagnosis?   (1)

    Chronic stable angina
    Ischaemic heart disease

2. Give three possible underlying pathophysiological processes which could be causing his symptoms   (3)

    Coronary heart disease
    Left ventricular outflow tract obstruction (aortic stenosis/HOCM)
    Oesophageal spasm

3. Give four investigations which you would order to confirm the diagnosis and help plan management.   (4)

    ECG
    Lipid profile
    Blood glucose
    Thyroid function
    Exercise tolerance test
    Myocardial perfusion scan
    Angiography
    Chest X-ray
    Full blood count
    ECHO

4. Name four aspects of a cardiovascular history or examination which would suggest an impaired prognosis.   (4)

    Unstable symptoms
    History of decompensation
    History of previous MI
    Advance age
    Gallop rhythm
    Signs of heart failure
    Diabetes
    Hypertension

5.   Name five classes of medication that are available to treat his condition.   (5)

Aspirin
Statins
Nitrates
Beta blockers
Calcium channel blockers
Potassium channel agonists

6.   Name two alternatives to medication that are available if this fails to control his symptom(2)

Revascularisation by angioplasty
Stent insertion or bypass surgery
Sympathectomy

Why is this a poor-quality question?

Scoring well for the SAQ hinges on the candidate knowing the correct diagnosis. If the candidate makes an incorrect initial diagnosis they may get every question thereafter wrong.

The question regarding investigations to confirm the diagnosis and help plan management is unfocussed. The model answer contains investigations which would confirm the diagnosis or help plan management. For example, a chest X-ray would help with the exclusion of other diagnoses but would not confirm the diagnosis of angina.

The model answer for classes of medications to treat his condition includes both anti-anginal therapy and classes of medications for secondary prevention of cardiovascular disease.
The model answer for class of medications should be antiplatelet rather than aspirin. Additionally, there is now a further class of drug for the treatment of angina – sinus node inhibitor/funny (Na) channel blocker (Ivabradine) for specialist treatment only.

Example SAQ reworked

A 62 year old man has gradually worsening exertional heaviness in his chest for one year. The chest pain starts when walking 500 meters or up a steep slope and is resolved within two minutes of rest. His GP suspects chronic stable angina. He is started on a glyceryl trinitrate spray for the acute episodes. Physical examination and his resting ECG are normal.

1.   Give two possible underlying pathophysiological processes which could be causing his symptoms.   (2)

Coronary heart disease
Left ventricular outflow tract obstruction/hypertrophic cardiomyopathy (HOCM)
Oesophageal spasm
(1 mark each)

2. Give two blood investigations to identify conditions which exacerbate angina with a reason for each. (4)

Haemoglobin/full blood count (1) – anaemia exacerbating angina (1)
Thyroid function (1) – increased metabolic rate/hyperthyroidism (1)

3. List five factors of clinical history or examination which have been shown to have an adverse outcome in patients with stable angina. (5)

Diabetes
Hypertension
Current smoking
Elevated total cholesterol
Increasing age
History of previous myocardial infarction
Signs or symptoms of heart failure
Signs of peripheral vascular disease
Pattern of occurrence of chest pain (recent onset or progression)
Severity of angina, particularly if unresponsive to treatment
(1 mark each)

4. Name three classes of medication that are available to treat his symptoms and ischaemia.(3)

Nitrates
Beta blockers
Calcium channel blockers
Potassium channel agonists
Sinus node inhibitor/Funny (Na) channel blocker
(1 mark each)

5. Name two classes of medication that are available to improve prognosis. (2)

Antiplatlet
Statin
(1 mark each)

6. List two alternatives to medication that are available if his symptoms are not controlled with optimal medical treatment. (2)

Revascularisation by percutaneous coronary intervention (1)
Coronary artery bypass surgery/grafting (1)
(1 mark each)

Review checklist for SAQ

The theme is pitched at an appropriate level for the intended group	
The scenario contributes to/establishes clinical relevance for the SAQ	
The length of the scenario is appropriate, it is detailed enough to answer the question	
The questions give an explicit expectation of what is required in the response	
The questions can only be interpreted in one way	
The question states the number of statements/ideas required in the answer	
There are no 'cues' that give away the answer in the question	
If the candidate answers a question incorrectly, subsequent questions can still be answered	
The model answer provided takes all possible interpretations of the question into consideration	
The title is appropriate and accurately reflects the content of all the question	
Only essential information is included	
The whole question adheres to house style	

Appendix 1: House Style for SBA

1. The language of the stem should be clear and concise. Use the present tense.
2. The stem poses the problem which is to be solved by **one** of the suggested answers in the option list.
3. Where appropriate, make the scenario patient focussed and include all or some the following components: age, gender, symptoms, duration, setting, relevant past history, family or social history, physical findings, results and investigations. Omit any irrelevant information.
4. Setting of care should only be given if this influences the decision about the correct answer.
5. Avoid making the scenario overcomplicated or misleading. If it is possible to use a simpler word/phrase then do so e.g., 'start' instead of 'commence'.
6. Write numbers up to nine in full and numbers above nine as digits.
7. Include gender for most questions particularly those involving diagnosis.
8. Use the terms 'woman' and 'man'.
9. Avoid gendered language where possible.
10. Avoid the terms 'presents with' or 'complains of' instead use 'has' e.g., A 54 year old man has chest pain.
11. Avoid the term 'history of' instead use 'with' e.g., with diabetes mellitus.
12. Drug history write 's/he is or they are taking' not 's/he is or they are on', write 's/he is or they are treated with' not s/he or they receives' or 's/he or they is started on'.
13. Do not use proprietary drug names unless essential; cite the generic name as used by the British National Formulary (BNF) for all medicines.
14. Avoid the phrase 'on examination' unless what follows is ambiguous.
15. Recommended format and order of initial observations is temperature, pulse, BP, respiratory rate, and oxygen saturation. 'His/her temperature is 37.5 °C, pulse rate 90 bpm, BP 120/80 mmHg, respiratory rate 14 breaths per minute, and oxygen saturation 97% breathing air'.
16. Investigations. Give actual value and reference range in parenthesis. Allow candidates to interpret clinical data e.g., if appropriate give haemoglobin result rather than stating 'patient is anaemic'. Empirical data is more discriminating.
17. Avoid abbreviations wherever possible except abbreviations that are widely understood e.g., BP, ECG, CT, MRI.
18. The lead in should pass the 'cover test' i.e., candidates should be able to arrive at the correct answer without being able to see the options. Avoid questions such as 'which of the following……?'.
19. Use 'which' instead of 'what'.
20. Ensure there is a list of 5 possible answers. These should normally be listed in alphabetical or numerical order unless there is a more logical alternative e.g. If listing vertebrae it may be more sensible to list C7, C8 before T1, T2 and T3.
21. All options should be plausible answers for the scenario, but four of the options should be inferior or incorrect.
22. Options should be grammatically and logically compatible with the lead in. Avoid grammatical cues: all answers should connect to the question.

Appendix 2: Template for writing SBA questions

Stem

e.g., clinical scenario, science based or laboratory vignette describing the problem
Max 50 words

Lead in

e.g., instructions asking a specific question
Which is the most likely….?

Correct Answer

Distractors
All of which are plausible

1. …………………………………………

2. …………………………………………

3. …………………………………………

4. …………………………………………

Programme and Learning Outcome

Condition:	
VARIABLES	
Age Range	
Gender ratios	M:F
Context/ Settings	
Common presenting complaints	
Associated Symptoms	
Duration	
Past history (including medication)	
Risk factors	
Vital signs - ranges	Temperature °C Pulse bpm BP mmHg Respiratory rate bpm Oxygen saturation % breathing _____
Physical findings	
First line investigation / imaging	

Appendix 3: Useful On-line Resources

The United States National Board of Medical Examiners has a free question writing guide. It contains examples of good (and bad) questions together with more detail on question preparation.

NBME: Item Writing Guide_2020

Writing clinical scenarios for clinical science questions.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4952967/