MCQs IN ANATOMY

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MCQs in Anatomy

A Self-testing Supplement to 'Essential Anatomy'

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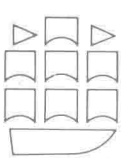

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Preface

An examination system which is to assess the results of a number of years of study should do so uniformly and reliably, should cover the entire syllabus, and should differentiate between good and bad candidates in a consistent manner. Multiple choice questions succeed to a large degree in fulfilling these requirements but it is important that candidates should be well practised in this form of examination technique.

These 394 multiple choice questions have been designed as an introduction to objective testing and cover the majority of important anatomical points. The questions, together with the adjoining answers, provide a useful revision guide. The present volume is based on our companion text *Essential Anatomy* published by Churchill Livingstone in 1976, and follows the same sequence. This enables the reader to refer easily to the textbook when more detail is required.

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1979

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Introduction

Objective Testing

The perfect examination would be one in which the student was accurately assessed in his knowledge, comprehension, application, analysis and evaluation of material pertinent to the subject being examined. The use of the essay type question paper as the sole means of assessment has been criticised because of its reliance on subjective qualities.

For several years educationalists of many different disciplines have sought methods of objective testing which examined all the above mentioned qualities. In all objective tests the student has to choose the correct response out of one or more alternatives, his answers being either right or wrong. The subjective judgement of the examiner thus plays no part in this form of examination. Objective testing has been used extensively in the U.S.A. since the end of the Second World War, but introduction in the U.K. has been slow, and it has reached the universities generally via schools and technical colleges. However, multiple choice question papers are now in use in most medical schools and it has been necessary for both the medical student and his teacher to become fully acquainted with the uses and abuses of this testing technique. It is appropriate here to consider the merits of the various examination techniques and, perhaps most important, to compare objective testing with the traditional essay question.

The Essay

Students and examiners have questioned the effectiveness of an essay paper in measuring the attainment of a number of years of study. The area covered by such an examination is very limited, the more so when a wide choice of questions is allowed. It thus encourages the students to 'spot questions' and to concentrate on only part of the syllabus. The marking of essays is time consuming and unreliable, there being variations in an individual examiner's reassessment of papers as well as between examiners. This variation makes comparison on a national level difficult and is further accentuated by what has been described as the deep psychological reluctance of examiners to allocate more than seventy per cent of the total marks allowed for any given essay question. However the essay does determine the candidate's ability to write clear and legible English, it tests his ability to collect and quantitate material, and it assesses his powers of logic, original thought and creativity. In terms of cost the essay question is cheap to produce but it is expensive to mark.

The Composition of Objective Questions

The objective form of examination is best composed by a panel of examiners, each having a complete understanding of the syllabus and a thorough knowledge of the field of study. The panel must first decide the parts of the syllabus to be covered by the examination, and the level of knowledge required by the candidate. The type of objective test and the number of options per question is decided and each member of the panel prepares a set of questions for the group to consider. A multiple choice question consists of a stem (the initial question) and four or more options; one of these options in the multiple choice question is correct and this is known as the key, the incorrect responses being known as the distractors. In the case of multiple response questions, there may be more than one correct response. (This form of question has also been termed multiple completion, multiple answer, multiple true or false and the indeterminate response by various authorities, but in most centres, and in this text, it will subsequently be referred to as a multiple choice question).

Stem and options should be brief using the minimum number of words and the instructions should be clear and simple, the language used being appropriate to the verbal ability and requirement of the candidate. The question must be of some educational value. The words 'always' and 'never' should be avoided and the stem should preferably not be in the negative. There should be no recurrent phrase in the options which can be included in the stem. The key (the correct option or options) must be wholly correct and unambiguous. It is important for the correct response to be in different positions in each of a group of questions and some form of random allocation may be necessary. The distractors (the wrong options) are the most exacting and challenging part of objective question composition and the standard of an objective test is probably best assessed in terms of the quality of its distractors. They must always be plausible, yet completely wrong. They should be in a parallel style to the key and they should not contain clues. Common misconceptions form good distractors. 'None of them' or 'all of them' are not satisfactory distractors. Four options are thought by many authorities to be sufficient.

After the draft questions have been collected, it is advisable for a panel of examiners to assess their value and limitations. Inaccurate and irrelevant material is then excluded. Even the most experienced of examiners will find that a panel will offer constructive criticism on the majority of his questions. Ideally, once the panel has accepted a series of questions these should be pre-tested on a group of students and the results analysed. It is desirable for a question to have been pretested on 300 to 400 students before it comes into regular use in a qualifying examination. The difficulty of a question can be determined by calculating the percentage of students giving the right answer, and its discriminatory value (the ratio of correct/incorrect responses) calculated in a manner which takes into account whether or not the better students obtained the correct response. The facility value (difficulty index) records the percentage of correct responses and compares it with the total number of candidates. Additional information on the mean range of distribution of the answers can also be obtained with a discriminatory index and a bi-serial correlation coefficient (relating the total candidate response to

an option, with the results of the top 27 per cent and the bottom 27 per cent of the candidates to the same option). Figures for both the discriminatory index and the bi-serial correlation coefficient range from plus 1 to minus 1. Questions with factors of less than 0.20 should be rejected (unless a few difficult or easy questions are to be included). Values of 0.21 to 0.29 are of marginal discriminatory value. The values 0.30 to 0.39 show a reasonable discriminatory power of the option, whereas results greater than 0.44 indicate good discrimination by a question of the candidates under test. The effectiveness of the question is also measured in terms of the number of students attempting it – the value of a question certainly cannot be assessed if a large number of students leave it out. Computer printouts on a series of questions will also provide the ranking of students, the scatter of the results and a raw score (i.e. the number of correct less the number of incorrect results).

The pretesting, though very time consuming, greatly adds to the validity and reliability of the objective test. Using the results of these tests the panel can rephrase unsatisfactory questions and compile the definitive examination paper. The time allowed in the pretest is not limited but the students are asked to note the time taken to complete the test; the time required for the final version is thus arrived at. This time should allow at least 90 per cent of the candidates to complete the paper. It is usual to start an examination paper with a few easier questions (i.e. with a low difficulty index) and similarly a few difficult questions can be included at the end. It has been found that a good (wide) range of results is obtained by setting a large number of questions with average discrimination rather than including a large number with high or low discriminatory indices. Testing of the questions should not stop after the pretesting phase, the information gained from each subsequent examination should be used to review continuously all the question material.

Obviously a series of questions which have been pretested and shown to be satisfactory is of great value to the examiner. Such questions can be used repeatedly provided they have not been freely available to the students. Security is an important factor, particularly when the number of questions is small and does not cover the whole syllabus. For this reason it is advisable to have a large number of questions available. It is reasonable to assume that if a student is capable of memorising the correct responses to a large number of questions (even if these are known to him) he will also have a passable knowledge of the syllabus.

A satisfactory bank of questions takes three to five years to build. After this time the questions can be grouped into sections and, whenever an examination paper is required, questions can be chosen at random from each section. Continuous updating and revision of this material should be undertaken and new material added regularly. The history of each question in the bank should be recorded. Repetitive use of the questions over a number of years allows annual standards to be compared.

The Student's Approach To Objective Testing

Any student required to undertake an objective test for a qualifying examination or a postgraduate examination should ensure he has some preliminary experience in this form of testing. It is essential for him to know

and have sampled the style of questions used by his particular examining board.

In any objective test all the instructions provided must be carefully read and understood and the student's designated number marked in the appropriate section, otherwise a computer marking system will reject the paper – this will not impress the examining authority.

The type of objective test used in medical education does vary and some of these types have already been discussed. Whatever form the question takes in the objective test it is essential that the student starts on his first quick 'run' through the questions by filling in all the answers he knows to be correct. On this first 'run' he should also mark (on the paper) the questions where he is fully acquainted with the material but is unsure of the correct response. On the second 'run' all his attention can now be given to this group of questions, in which he should be able to make an informed guess. Experience has shown that his chances of being correct in this situation are above average. He should, as one examiner expresses it, 'play his hunches'. The questions which he does not understand are probably best left unanswered as at best he can only hope for a 50 per cent chance of a correct response on a random basis in the true/false situation, and only a 25 per cent chance of a correct response in a four item multiple choice question. In multiple choice questions the marking is usually positive, a mark being given for a correct answer and none for an incorrect one. In multiple response questions (as in this text) a mark is given for each correct response, whether this be true or false, and usually a mark is subtracted for each incorrect response. Most examination systems have now abolished the use of a correction factor for guessing as this was found to have little effect on the ranking of the candidates, it has also been realised that informed guessing is in itself a useful discrimination.

Lack of time is not usually a problem in medical objective testing. Since these tests are of the 'power' rather than the 'speed' variety, i.e. knowledge rather than ability against the clock is being tested. Excessive time may be a disadvantage to the candidate as repeated reassessment of the answers may distract from the correct response rather than produce improvement. In the multiple choice situation it has been found that one minute is usually necessary per question although more time is required to answer a question containing a number of distractors.

Transcribing 300 items from a question paper to an answer sheet (i.e. 60 questions each with 5 options) takes a minimum of 10 minutes and the habit of leaving such transcriptions to the end of an examination is best avoided since, if rushed, it may introduce unnecessary inaccuracies.

Etymological Hazards

The rarity of absolutes in anatomy means that a large variety of adjectives and adverbs are commonly used in its description. These increase the difficulty of both setting and answering multiple choice questions. Although one can question the desirability of assessing knowledge which is dependent on the 'strength of an adjective', these adjectives do form the language of present day medical practice. This factor is borne out by their use in some questions and answers of the present text. Nevertheless, the examiner must avoid ambiguity and in addition his questions must not contain clues to the

correct answer. Such terms as 'invariable', 'always', 'must', 'all', 'only', and 'never' should be avoided since they imply absolutes and are therefore likely to be wrong.

The terms 'may' and 'can' also give rise to ambiguity. In anatomy almost anything 'may occur' and statements using this phrase are unlikely to be completely wrong. If these terms are used and the student is able to answer that the question 'certainly may' or 'certainly may not', he has little chance of being wrong. The term 'sometimes' comes into the same category.

The adjectives and adverbs 'common', 'usual', 'frequent' (commonly, usually, frequently), 'likely' and 'often' are an integral part of everyday medical language but their use in the multiple choice question may also lead to ambiguity. Their meanings are very similar yet their values depend largely on the context of the question. Expressed as incidences they may well range from 30 to 70 per cent. They may be considerably modified by the addition of 'quite', 'most', 'very' and 'extremely'. The examiner must be particularly careful of his choice of these terms. The 'majority' implies more than 50 per cent, whereas the 'vast majority' implies nearly 100 per cent.

The term 'typical' is a useful one for multiple choice questions. Its meaning implies 'that which is found most commonly'. 'Characteristic' implies a time honoured anatomical feature, and 'recognised' an accepted textbook description. Further vague terminology used in medical practice yet best avoided in the multiple choice question include 'associated with', 'accompanied by', 'related to', 'linked with' and 'lend support to'.

On the negative side, 'uncommon', 'unusual', 'infrequent' (uncommonly, unusually, infrequently), 'unlikely' and 'rare' are all terms commonly used yet their use in the multiple choice question must not give rise to ambiguity. As with their positive equivalents they are markedly influenced by the addition of such terms as 'most' and 'very'. The term 'significant' is best kept for its statistical use and the terms 'increased' and 'more' should be restricted to direct comparative situations.

In conclusion, words used in multiple choice questions, although giving rise to apparent ambiguity, remain those in common use in medical practice; both the examiner and the student must be fully conversant with their meanings and disadvantages in order to avoid any confusion. It is hoped that the questions which follow will also help in this regard.

Contents

How to use this book

The text, consisting of questions and answers ('true or false'), is arranged throughout in such a way that all questions appear on left-hand pages and all answers on right-hand pages.

In use the student may conveniently cover the right-hand page with a blank sheet on which to jot down his answers for comparison.

true or false

I The Structure of the Body

1 The cell:

a Nucleus is composed of cytoplasm. ( )

b Has enzymes which are associated with the mitochondria. ( )

c Contains an endoplasmic reticulum concerned with protein synthesis. ( )

d Has a Golgi apparatus which lies just within the nuclear membrane. ( )

2 Epithelial tissue:

a Gives rise to the sebaceous glands of the scalp. ( )

b Undergoes constant renewal in most regions of the alimentary tract. ( )

c Lining the urinary tract contains numerous goblet cells. ( )

d Lining the respiratory tract is keratinised. ( )

3 Exoctine glands:

a Typically discharge their contents directly into the blood stream. ( )

b Usually secretes in a holocrine manner. ( )

c Are of mesenchymal origin. ( )

d Are absent in stratified squamous epithelium. ( )

4 Elastic fibres are:

a Prominent in hyaline cartilage. ( )

b Formed from fibroblasts. ( )

c Prominent in superficial fascia. ( )

d Prominent in aponeuroses. ( )

a **F**— The protoplasm of the nucleus is karyoplasm. Cytoplasm is the protoplasm of the cell body.
b **T**— These enzymes are essential to the metabolism of the cell.

c **T**— The network is scattered throughout the cytoplasm.

d **F**— The apparatus lies outside the nucleus and is primarily concerned with cell secretion.

a **T**— And to most other glands.
b **T**— The alimentary tract is lined by simple epithelium between the oesophagus and the anal canal.
c **F**— The transitional epithelium of the urinary tract contains few glands.
d **F**— The lining is mostly ciliated columnar epithelium with numerous goblet cells.

a **F**— This is the definition of an endocrine gland. Exocrine glands have ducts opening on to a surface.
b **F**— Most exocrine glands secrete without damage to the cell, i.e. merocrine or epicrine secretion, as do most endocrine glands.
c **F**— They are of epithelial origin.
d **F**— Sebaceous and sweat glands are common in this form of tissue.

a **F**— Hyaline cartilage contains many cells and a few fine collagen-like fibres in the matrix.
b **T**— And found mainly in some ligaments attached to vertebrae.
c **F**— This tissue is a mixture of fat and collagen fibres.
d **F**— These are formed mainly of collagen fibres.

true or false

5 **Hyaline cartilage:**

a Contains a few fine collagen-like fibres. ( )

b Is the bony precursor in cartilaginous ossification. ( )

c Unites the sphenoid and occipital bones in the child. ( )

d Forms the knee menisci. ( )

6 **Long bones:**

a Usually ossify in mesenchyme. ( )

b Consist entirely of compact bone. ( )

c Normally contain yellow marrow. ( )

d Are organised in Haversian systems. ( )

7 **Cartilaginous ossification:**

a Occurs in all long bones except the clavicle. ( )

b Occurs in cartilage which has replaced a membranous model. ( )

c Has its primary centres appearing at about the 18th week of intra-uterine life. ( )

d Secondary centres typically fuse at puberty. ( )

8 **In the development of a long bone:**

a Osteoblasts come to line the primary alveoli. ( )

b Osteoblasts become the osteocytes. ( )

c Ossification extends along the body of the bone as endochondral ossification. ( )

d The epiphyseal plate separates the metaphysis from the diaphysis. ( )

a T— And is found in synovial joints and in costal cartilages.
b T— Ossification in mesenchyme takes place on a fibrous tissue model.
c T— Growth in length of the skull occurs mainly at this joint; bony fusion occurring after the appearance of the last molar tooth, about the 25th year.
d F— These are formed of fibrocartilage.

a F— Long bones usually ossify in hyaline cartilage.
b F— Compact bone is found in the body of the bone but cancellous bone occupies most of the ends of the bones.
c T— In the healthy adult the marrow is of the yellow variety.
d T— Bone is laid down in concentric layers centripally. Small blood vessels are usually found in the middle.

a T— The clavicle has a mixed mesenchymal and cartilaginous ossification.
b T— The cartilage is of the hyaline type.

c F— These usually appear in the 8th week of intra-uterine life.

d F— Secondary centres usually appear between birth and puberty, and fuse about the 18th–20th year.

a F— Osteoblasts line the larger secondary alveoli formed by the
b T osteoclasts absorbing the calcified matrix of the cartilage.
c T— The cartilage model is gradually replaced by bone.

d F— The epiphyseal plate lies between the epiphysis and the metaphysis.

true or false

9 **Primary cartilaginous joints:**

a Unite the lower end of the tibia and fibula. ( )

b Occur between the teeth and jaw. ( )

c Comprise the sutures of the vault of the skull. ( )

d Unite the two pubic bones. ( )

10 **In synovial joints the:**

a Articular surfaces are all lined by hyaline cartilage. ( )

b Fibrocartilaginous discs usually partially divide the joint cavity. ( )

c Hinged variety is exemplified by the metacarpophalangeal joints. ( )

d Stability of the joint is generally inversely related to its mobility. ( )

11 **Striated (voluntary) muscle:**

a Contains alternating A and Z bands. ( )

b Fibres are multinucleate. ( )

c Is present in the upper part of the oesophagus. ( )

d Fibres are bound together by the sarcolemma. ( )

12 **In muscular activity:**

a A synergistic muscle is one that relaxes against the pull of gravity. ( )

b A parallel arrangement of fibres provides a more powerful movement than an oblique arrangement. ( )

c Antagonistic muscles oppose the prime movers. ( )

d Innervation is by the muscle spindles. ( )