

# **Multiple Choice Questions in Anatomy and Neurobiology for Undergraduates**

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# Preface

The preparation of reliable, unambiguous multiple choice questions constitutes a lengthy and exacting task. Even though a committee of individuals may have scrutinized questions before their acceptance into a bank, ambiguities frequently become apparent only after use and in consequence of item analysis of question data. For this reason academic departments tend to hoard multiple choice questions, aspiring, usually unsuccessfully, to keep them secret from the students on whom they are used. Opportunities for learning from the questions are thus hindered rather than fostered.

It is hoped that the publication of this collection of questions will somewhat diminish the need for such hoarding and secrecy. The majority are accompanied by item analyses which would enable them to be used with confidence for testing relevant subject content.

For students, especially those subjected to objective tests of performance, the opportunity to obtain feed-back from responses to multiple choice questions is always welcome. In this instance the feed-back will be certainly fuller and more reliable than may be obtained from previously untested questions.

This collection of questions has been drawn from a question bank built up for specifically undergraduate tests through several years of use. Many past and present members of the academic staff of the Department of Anatomy in the University of Sydney have been involved in either its initial compilation or subsequent modifications. To all of these we extend our grateful thanks. In particular we are indebted to Dr. A. E. Sefton and Professor W. Burke for the physiology questions in the section of neurobiology, and to Dr. M. Arnold for carefully checking the manuscript and proofs.

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Sydney

Michael Blunt  
Makram Girgis

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# Chapter 1

## Description, Aims, Suggestions to Users

This book of multiple choice questions is primarily intended for the use of medical undergraduates, for whom it has three main aims.

- (1) To facilitate the learning of topographical anatomy and neurobiology.
- (2) To provide a measure by which progress may be assessed.
- (3) To provide practice in anatomy MCQ's.

It is, in addition, hoped that the questions presented will be useful to academic anatomists building up their own question banks.

Questions have been grouped for each visceral system and the nervous system; in the case of the body framework (including peripheral nerves and blood vessels), however, a regional grouping has been adopted. In pursuit of the aim to facilitate learning all headings and sub-headings follow the order used in *A New Approach to Teaching and Learning Anatomy* (Blunt, 1976). Moreover, each question is referred to an objective or series of objectives in that book. Thus, individuals using *A New Approach to Teaching and Learning Anatomy* as a companion volume may readily obtain immediate feed-back on their achievement of the objectives which it designates. In most instances reference is made to one or more general instructional objectives and to one or more specific learning objectives. On occasions, however, when it is considered that there is no sufficiently close match with specific learning objectives, only a general instructional objective is indicated.

In fostering the aim of providing students with an immediate measure of progress each question has been accompanied alongside by its correct answer. Most questions are also accompanied by an indication of the percentage of students who obtained the correct answer on occasions of previous settings and by a biserial correlation coefficient ( $r$  biserial), indicative of the capacity of the question to distinguish between more able and less able students. Inclusion also indicates the statistical significance of the  $r$  biserial at the 0.05

## 2 DESCRIPTION, AIMS, SUGGESTIONS TO USERS

level of probability. Thus, the student can tell at a glance whether the question he has attempted has been validated by previous use, and, if so, what levels of difficulty and discrimination it presented. The figures shown relate to groups of about 250 undergraduate medical students. In instances where questions have been set several times, there may be substantial variation in performance reflecting essentially differences in preparedness on the basis of teaching given. Clearly no absolute significance is attached to the performance levels recorded, but they serve as a general guide to levels of difficulty experienced by a group of students who had prepared themselves for a test. Biserial correlation coefficients vary from 0 to 1 and may be given the sign + or - according to the direction of the discrimination. All those given in fact represent positive discrimination so the sign has been omitted. The closer the values shown approach to 1 the better the questions distinguish between students getting higher total marks and less able colleagues. The indication that the  $r$  biserial is significant at a probability level of 0.05 means that a value as large as this will occur by chance only 5 times in 100 samples.

Questions which have been tried but found wanting have not been included in this collection. Thus, an item analysis, when given, is indicative of valid testing in relation to the objectives on which the question is based. By using the data provided instructors may be assisted in the preparation of criterion referenced test papers at predetermined levels of difficulty. Student users should appreciate that with the higher  $r$  biserials there is a greater likelihood that more able members of previous cohorts of students sitting a question did not encounter ambiguities or semantic problems. Such problems are a well known hazard of multiple choice questions and the best guarantee that they have been overcome is the evidence of an  $r$  biserial reaching at least the 0.05 level of significance. In the instances in which no item analysis is given, questions have not been tested by previous use and their reliability is as yet an unknown quantity.

Each chapter of the book contains three types of questions, designed, according to the Hubbard and Clemans (1961) classification, to test knowledge in different ways. Type A items involve choosing a single correct answer from five available choices. Type E items are used to elicit information on the cause-effect relationship between sets of data. Type K items call for the perception of one or more correct responses among four alternatives and the responses may be grouped in five different ways. Type A items thus predominantly require the recall of isolated items of knowledge, whereas Type E and K questions additionally require perception of the congruence or cohesiveness between sets of data (Blunt and Blizard, 1975).

### Suggestions to users

(1) Use a strip of paper or a ruler to cover the right-hand column of data which includes the correct answers to questions.

(2) Determine how many questions will be attempted and set a total time limit of 1½ minutes per question.

(3) Jot down your answers to questions, remembering that if you do *not* commit yourself to paper it is easy enough to delude yourself as to what you *would* have decided!

(4) Check whether your scores compare well with those indicated in the data column.

(5) Analyse the reasons for incorrect answers. If the reason is simply insufficient knowledge the remedy is obvious. If, on the other hand, your incorrect response was associated with the feeling that you knew the correct answer, it may have been due to insufficiently accurate reading of the question or to incorrect interpretation of it. In the latter case perusal of the r biserial will provide some indication of the likelihood of ambiguity.

## References

- Blunt, M. J. (1976). *A New Approach to Teaching and Learning Anatomy: Objectives and Learning Activities*. London: Butterworths
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- Hubbard, P. J. and Clemans, W. V. (1961). *Multiple Choice Examinations in Medicine. A Guide for Examiner and Examinee*. Philadelphia: Lea and Febiger



## Chapter 2

# The Upper Limb

### Type A items (Hubbard and Clemans, 1961) (Questions 1–88)

These involve choosing one correct answer from five available choices. The instruction for these items is as follows:

*Each of the incomplete statements below is followed by five suggested answers or completions. Select the one which is best in each case.*

(1)\* (2)\* (3)\*

#### A(i) Shoulder region (Questions 1–22)

##### 1 The serratus anterior muscle

- (A) is a medial (downward) rotator of the scapula.
- (B) is a lateral (upward) rotator of the scapula.
- (C) is a retractor (adductor) of the scapula.
- (D) acts in association with the subscapularis in rotation of the scapula.
- (E) participates in adduction of the shoulder.

Objectives† 7; 1; 2; (2.2).

0.40 46 B  
0.65 79

- \* (1) Biserial coefficient
- (2) Percentage of correct answers
- (3) Correct answer

See pages 1–3 for explanation

† See pages 1–3 for explanation

- 2 Upward (lateral) rotation of the scapula is mainly produced by the

(A) trapezius and rhomboid muscles.  
 (B) trapezius and serratus anterior muscles.  
 (C) serratus anterior and levator scapulae muscles.  
 (D) levator scapulae and trapezius muscles.  
 (E) serratus anterior and teres major muscles.

Objectives 7; 1; 2; (2.3), (2.4).

0.43 67 B  
 0.56 65

- 3 To test for trapezius muscle paralysis, you would ask the patient to

(A) abduct the arm fully.  
 (B) flex the arm fully.  
 (C) push against a wall.  
 (D) shrug the shoulder.  
 (E) adduct the arm against resistance.

Objectives 7; 1; 2; (2.2).

0.40 92 D

- 4 Features of the scapula include

(A) coracoid process continuous with spine of scapula.  
 (B) acromion process the most laterally projecting part.  
 (C) coracoid process projecting forwards and medially.  
 (D) glenoid fossa projecting from the spine.  
 (E) glenoid fossa projecting from coracoid process.

Objectives 7; 1; 1; (1.2). 7; 1; 3; (3.1).

0.32 81 B  
 0.35 88

- 5 In abduction of the arm

(A) the clavicle remains fixed.  
 (B) the scapula retracts (adducts)

## 6 THE UPPER LIMB

- (C) scapular movement is at first more rapid than movement of the humerus.
- (D) the scapula rotates medially (downwards).
- (E) the medial end of the clavicle moves downwards on the articular disc.

Objectives 7; 1; 1; (1.7), (1.10). 7; 1; 3; (3.6). 0.53 76 E

### 6 The intracapsular structures of the shoulder joint include the tendon of the

- (A) pectoralis major muscle.
- (B) subscapularis muscle.
- (C) supraspinatus muscle.
- (D) long head of biceps muscle.
- (E) short head of biceps muscle.

Objectives 7; 1; 1. 0.21 62 D

### 7 The sternoclavicular joint

- (A) has two separate joint cavities.
- (B) lies at the level of the second costal cartilage.
- (C) is strengthened by the conoid ligament.
- (D) is a fibrous joint.
- (E) has none of the above properties.

Objectives 7; 1; 1; (1.7). 0.48 79 A

### 8 The close-packed position of the shoulder joint occurs with the arm

- (A) by the side of the body.
- (B) at 90° abduction with medial rotation.
- (C) at 90° abduction with lateral rotation.
- (D) at 180° abduction with medial rotation.
- (E) at 180° abduction with lateral rotation

Objectives 7; 1; 1. 0.28 15 E

- 9 The muscle pair most important in abduction at the gleno-humeral joint is

(A) deltoid and subscapularis.  
 (B) deltoid and supraspinatus.  
 (C) supraspinatus and subscapularis.  
 (D) teres major and subscapularis.  
 (E) deltoid and teres major.

Objectives 7; 1; 2; (2.3).

0.22 97 B  
 0.25 97  
 0.64 95

- 10 The rotator cuff muscles of the shoulder

(A) are supplied by the radial and suprascapular nerves.  
 (B) have important attachments to the capsule of the shoulder joint.  
 (C) include the teres major muscle.  
 (D) are the only muscles involved in lateral rotation.  
 (E) are all adductors of the arm at the shoulder.

Objectives 7; 1; 2.

0.34 74 B  
 0.46 68

- 11 Adduction at the gleno-humeral joint is produced by the

(A) pectoralis minor.  
 (B) deltoid.  
 (C) supraspinatus.  
 (D) subclavius.  
 (E) pectoralis major.

Objectives 7; 1; 2; (2.2), (2.3).

— — E

- 12 In a normal antero-posterior radiograph of the shoulder region, taken in the anatomical position, the most lateral bony feature is

(A) the acromion.  
 (B) the lesser tubercle.

8 THE UPPER LIMB

- (C) the coracoid process.
- (D) the greater tubercle.
- (E) none of the above.

Objectives 7; 1; 1; (1.8).

0.36 72 D

13 The humerus has

- (A) a greater tubercle located medial to the lesser tubercle.
- (B) the capsule of the shoulder joint attached around its surgical neck.
- (C) a capitulum which articulates with the olecranon process.
- (D) a covering of synovial membrane over its head.
- (E) a greater tubercle which projects further laterally than the acromion.

Objectives 7; 1; 1; (1.4), (1.5), (1.6).  
7; 1; 3; (3.1), (3.4).

0.40 68 E  
0.44 82  
0.47 85

14 The clavicle

- (A) articulates by a synovial joint with the coracoid process.
- (B) underlies the coracoid process.
- (C) articulates (via an articular disc) with the manubrium sterni and first costal cartilage.
- (D) articulates supero-laterally with the acromion process.
- (E) presents a conoid tubercle on the inferior surface of the shaft close to the medial end.

Objectives 7; 1; 1; (1.1), (1.2), (1.3), (1.7).

0.31 41 C

15 Medial rotation at the gleno-humeral joint may be performed by the

- (A) subscapularis.
- (B) supraspinatus.

- (C) infraspinatus.
- (D) teres minor.
- (E) posterior fibres of deltoid.

Objectives 7; 1; 2; (2.3).

0.54 94 A

16 In the anatomical position, the

- (A) vertebral margin of the scapula diverges from the sagittal plane.
- (B) coracoid process points medially.
- (C) inferior angle of the scapula overlies the 6th rib.
- (D) acromion occupies a horizontal plane.
- (E) above statements are not correct.

Objectives 7; 1; 1; (1.2). 7; 1; 3; (3.1), (3.2), (3.7). 0.30 33 D

17 Abduction at the shoulder in the scapular plane to  $180^\circ$  requires

- (A) a laterally rotated gleno-humeral joint.
- (B) contraction of the rotator cuff muscles.
- (C) retraction, elevation and upward rotation of the scapula.
- (D) more scapular rotation than gleno-humeral movement.
- (E) scapular movement followed by gleno-humeral movement.

Objectives 7; 1; 2; (2.3). 7; 1; 3; (3.6). 7; 1; 3. — — A

18 The latissimus dorsi muscle

- (A) is a lateral rotator of the humerus.
- (B) is a lateral (upward) rotator of the scapula.
- (C) lies wholly inferior to the scapula.
- (D) is an adductor and extensor at the gleno-humeral joint.
- (E) is an extensor and lateral rotator at the gleno-humeral joint.

Objectives 7; 1; 2; (2.2).

0.43 90 D

10 THE UPPER LIMB

19 If the trapezius is paralysed

- (A) elevation of the shoulder is impaired.
- (B) medial rotation of the arm is impaired.
- (C) lateral rotation of the arm is impaired.
- (D) the scapula cannot be protracted.
- (E) medial (downward) rotation of the scapula is impaired.

Objectives 7; 1; 2; (2.2).

0.37 91 A

20 A muscle not included among the medial rotators of the shoulder joint is

- (A) pectoralis major.
- (B) latissimus dorsi.
- (C) teres major.
- (D) teres minor.
- (E) subscapularis.

Objectives 7; 1; 2; (2.3).

0.37 96 D

21 The muscle pair which most importantly assists in elevating the arm above the head is

- (A) trapezius and pectoralis minor.
- (B) levator scapulae and serratus anterior.
- (C) rhomboid major and serratus anterior.
- (D) rhomboid major and levator scapulae.
- (E) trapezius and serratus anterior.

Objectives 7; 1; 2; (2.3).

— — E

22 Protractors of the scapula include the

- (A) pectoralis major.
- (B) subscapularis.
- (C) serratus anterior.
- (D) trapezius.
- (E) rhomboid muscles.

Objectives 7; 1; 2; (2.3).

0.52 73 C

**A(ii) Shoulder region including nerve supply (Questions 23–33)****23 The deltoid muscle**

- (A) is supplied by the musculocutaneous nerve.
- (B) acts as both a flexor and an extensor of the arm.
- (C) is an adductor of the arm.
- (D) acts unaided in abduction of the arm.
- (E) is a depressor of the scapula.

Objectives 7; 1; 2; (2.2)

0.44 81 B

**24 The infraspinatus muscle**

- (A) is supplied by the suprascapular nerve.
- (B) is supplied by the axillary nerve.
- (C) is a medial rotator of the humerus.
- (D) is supplied by the subscapular nerve.
- (E) has none of the above properties.

Objectives 7; 1; 2; (2.2), (2.3). 7; IV; 1.

0.50 84 A

**25 The serratus anterior muscle**

- (A) is supplied by the thoraco-dorsal nerve.
- (B) is a retractor (adductor) of the scapula.
- (C) helps in abduction of the arm.
- (D) rotates the scapula medially (downwards).
- (E) has none of the above properties.

Objectives 7; 1; 2; (2.2), (2.3). 7; IV; 1.

0.38 66 C

**26 The teres major muscle**

- (A) is supplied by the radial nerve.
- (B) runs parallel to and above the teres minor.
- (C) obtains its nerve supply from the axillary nerve.
- (D) assists in adduction and medial rotation of the humerus.
- (E) has none of the above properties.

Objectives 7; 1; 2; (2.2), (2.3). 7; IV; 1; (1.5).

0.48 92 D



## 12 THE UPPER LIMB

### 27 The deltoid muscle

- (A) acts unaided in abduction of the arm.
- (B) is a depressor of the scapula.
- (C) is an adductor of the arm against resistance.
- (D) acts in abduction in association with supraspinatus.
- (E) is supplied by the musculo-cutaneous nerve.

Objectives 7; I; 2; (2.2), (2.3). 7; IV; 1; (1.5). 0.32 99 D

### 28 The serratus anterior muscle

- (A) is supplied by the thoraco-dorsal nerve.
- (B) is a retractor of the scapula.
- (C) helps in abduction of the arm.
- (D) interdigitates with eight slips of the latissimus dorsi.
- (E) has none of the above properties.

Objectives 7; I; 2. 7; IV; 1. 0.38 40 C  
0.46 30

### 29 Lateral rotation of the arm at the gleno-humeral joint is

- (A) produced by contraction of teres major muscle.
- (B) associated with adduction of the arm at the gleno-humeral joint.
- (C) produced by contraction of muscles supplied by the 5th and 6th cervical spinal nerves.
- (D) produced by contraction of subclavius muscle.
- (E) produced by contraction of subscapularis muscle.

Objectives 7; I; 2; (2.3). 7; IV; 1; (1.6). 0.55 71 C  
0.55 72

### 30 The coracobrachialis muscle

- (A) is supplied by the median nerve.
- (B) is supplied by the axillary nerve.