Section 2 of the BioMedical Admissions Test (BMAT):
Notes for test-takers

For universities in the Netherlands

2019
BMAT: some important points to note

Section 2 general points

For this test you are only allowed a pen and a pencil, you are not allowed:

- calculator
- BINAS
- periodic table.

You are expected to recall and use science and mathematics knowledge without any reference materials.

You have 40 minutes to complete the 27 questions in Section 2 (on average, less than 90 seconds per question), so note the following:

- Work quickly.
- If you find a question particularly difficult or time consuming, move on to a different question and come back to it later if you have time.
- Guess the answers you are not sure about.
- Estimation can be a useful approach to numerical calculations (though the questions will not ask you to estimate – you must decide whether to or not).
- Decimal points are used rather than commas: for example 1.6 cm instead of 1,6 cm.

In the following information, the guide referred to is the BMAT Section 2: Assumed Subject Knowledge guide. This guide, the test specification and specimen papers can all be accessed at:

admissiontesting.org/bmat-netherlands-prep

Biology

The amount of subject matter covered by BMAT is less than you have covered in school. Topics like animal behaviour, the immune system or the anatomy and physiology of plants are just examples of some of the topics that are not assessed by the test. Some other topics are covered in less detail, for example genetics, anatomy and endocrinology. This may make it seem like the biology questions will be easy – they are not necessarily. It may be helpful to be aware of these points:

- In anatomy you are expected to know all the English names for structures, as provided in the guide (such as pages 30 – 51).
- Notation for some topics is slightly different to what you are used to, such as with genetics, especially monohybrid crosses (e.g. page 59).
- Aspects of population dynamics, such as predator-prey and host-parasite interactions can be included in this test. These are not compulsory in Dutch schools and are taught in only some schools. These subjects may or may not require some basic additional study (such as page 70).
- Because the BINAS will not be available during the test, you should know the details of the Carbon and Nitrogen Cycles (such as pages 76 – 78).

Chemistry

Much of the chemistry you can be expected to know you have already covered at school, and the guide should serve as a reminder of this. There are some topics that you may not have covered in school and differences in approach to others; a list of some of these points to note is given below:

- You are expected to be able to relate the electronic structure to position in the periodic table (such as the content on pages 82, 83, 114 in the guide).
- Some terminologies may be new to you, such as:
  - electrophiles: these accept a pair of electrons (and so form a bond to the donor atom)
  - nucleophiles: these donate an electron pair to an electron deficient carbon atom (δ+C) (page 99).
- In this test, and in the guide, ionic salts in solution are not separated into their different ions. For example, aqueous copper sulfate solution would be written as CuSO$_4$(aq).
- In this test, and in the guide, coefficients (balancing numbers) and formulae in equations are not separated by a space.
• You are not given a periodic table or BINAS, but you are expected to know key concepts and facts such as reactivity (e.g. pages 91, 115, 117), solubility (e.g. page 88, 89, 143), flame tests and gas tests (e.g. page 169), colours of precipitates (e.g. pages 170, 171), properties of metals (pages 94 and 95), the position of common elements in the periodic table (e.g. pages 81, 115, 117, 120), the difference between complete and incomplete combustion of hydrocarbons (page 103), the reactions of the alkali metals (page 116) and the halogens (pages 118 and 119), and the formulae of ions (page 112).

• The molar volume of a gas at room temperature and pressure is 24.45 dm³ mol⁻¹; in the test and in the guide this is rounded to 24 dm³ mol⁻¹ (page 132) for ease of calculation.

• For redox reactions, the terminology in the guide and the test will be a bit different to what you know:
  - Extraction means producing the metal from the salt (the ore) by means of a reaction (not a separation) (e.g. pages 90 – 93).
  - The oxidation state is the theoretical charge present on an atom. To calculate this, put all known charges in place and calculate the remainder (for example page 119).
  - For the definition of oxidising agent or reducing agent, the focus is on the process: the oxidising agent oxidises another species by removing electrons from it (the oxidising agent is itself reduced as it gains electrons). (for example see pages 145 – 147).

• For electrolysis, the terminology in the guide and the test will be a bit different to what you know:
  - The positive (+ve) electrode is the anode, the negative (–ve) electrode is the cathode (for example see pages 93, 177 – 181).
  - The production of hydrogen or oxygen gas from an aqueous solution is explained by the presence of $\text{H}^+ / \text{H}_2\text{O}^+$ and $\text{OH}^-$ ions due to the self-ionisation of water: $\text{H}_2\text{O} \rightleftharpoons \text{H}^+ + \text{OH}^-$ or $2\text{H}_2\text{O} \rightleftharpoons \text{H}_3\text{O}^+ + \text{OH}^-$ (e.g. pages 178 – 179).
  - There is no Dutch translation for the word electroplating. It means covering an object with a layer of any metal by means of electrolysis (e.g. page 181).

Physics

Much of the physics you can be expected to know you have already covered at school, and the guide should serve as a reminder of this. There are some topics that you will not have covered in school; some of these are given below:

• That the frequency of a wave is defined at the source, and does not depend on the medium (page 205).
• The concept of momentum and how it is related to force and used to solve problems (e.g. pages 230 – 232).
• The Doppler effect, a phenomenon that can be used to measure the speed with which an object is travelling, using waves (it is used in medicine to measure blood speed, and in law enforcement to measure the speed of vehicles) (see page 289).
• Rutherford scattering (e.g. page 261).
• Acceleration due to gravity, $g$, is also known as the gravitational field strength (the force per unit mass). The value of $g$ on Earth is about $10 \text{ m/s}^2$, or $10 \text{ N/kg}$ (see page 222). Questions will use $10 \text{ N/kg}$.
• Transformers (e.g. pages 258 – 260).
• Nuclear fission (e.g. pages 274 – 275).
• Matter: state changes (e.g. pages 190 – 191).

Some terminology is different, such as:

<table>
<thead>
<tr>
<th>English</th>
<th>Dutch</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance (p. 216)</td>
<td>Afstand, afgelegde weg</td>
</tr>
<tr>
<td>Displacement (p. 216)</td>
<td>Verplaatsing</td>
</tr>
<tr>
<td>Gradient of a graph (p. 217)</td>
<td>Helling van een grafiek</td>
</tr>
<tr>
<td>Momentum (p. 227)</td>
<td>(Lineaire) Impuls</td>
</tr>
<tr>
<td>Thermistor (p. 244)</td>
<td>NTC</td>
</tr>
<tr>
<td>Fuse (p. 244)</td>
<td>Zekering, smeltveiligheid</td>
</tr>
</tbody>
</table>
Mathematics

Much of the mathematics you are expected to know you will have already covered at school, and the guide should serve as a reminder of this. There are some topics that you will not have covered in school, and the details will depend on which mathematics course you have taken. It is important that you look carefully at the test specification and identify all the areas you might not have studied in school and then use the guide to help you study these.

The approaches you will need to take when tackling mathematics questions are quite different to the approaches you will probably have taken in school exams. Working though past papers, under timed conditions, will help you get used to these approaches. Time is a factor in these papers so practising under timed conditions will help you get used to working both quickly and accurately.

If you have studied mathematics B, you should take some time to learn topics such as data handling, probability and statistics (e.g. pages 374 – 397). Also note that the part on quadratic graphs, harder graphs and transformations (e.g. pages 341 – 345) are covered in rather less depth than you are probably used to. Be advised that your normal approach to these subjects, as taught in school, will often be too time consuming. Usually an easier approach, such as those shown in the guide, will suffice.

If you have studied mathematics A, you should take some time to learn topics such as geometry and trigonometry from the guide (e.g. pages 347 – 371). The questions in the test will often combine geometry or probability with other topics, which the guide does not address. You may also need to refresh your algebra skills.

In both cases, there are some topics that you will not have studied in school, such as upper and lower bounds, and topics that are not addressed very often like simultaneous equations (e.g. pages 308, 331 – 332).

An approach to preparation

Read the test specification, then look through the guide and note down the page numbers of any topics that you either need to learn, or that you need to revise.

Learn/revise these topics using the guide. If the explanation in the guide is not clear, then look for support from other places, such as the internet or textbooks. For topics that involve mathematical relationships and calculation, it is useful to look for practice material that may not resemble BMAT questions but will help you develop your understanding of the topic. You may find this practice material in textbook exercises and on the internet.

In addition to making sure you have studied all the topics that might be examined in the test, it is a very good idea to practise taking specimen papers under timed conditions.

Specimen papers and the test specification can be found at:

admissionstesting.org/bmat-netherlands-prep

and further practice papers and a range of other resources at:

admissionstesting.org/bmat-prep.

Review the guide again, and then try the specimen paper and work to the time given.

Other past BMAT papers are on the internet (at admissionstesting.org/bmat-prep), and these can be useful to prepare with, but please be aware that some of the topics are no longer in the test, and some topics not on the past papers can now be asked in the test. Please also note that for Section 2 you have an additional 10 minutes test time to use the Dutch glossary. So past BMAT papers are useful, but not as useful and representative as the specimen paper.
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