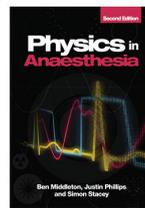


Chapter 21

Electrocardiography, pacing and defibrillation



Self-assessment questions

These questions and answers, in both MTF and SBA formats, accompany *Physics in Anaesthesia 2e* and link back to the book for guidance.

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Multiple true / false questions

For each of the following questions, mark all answers as either true or false

1. Regarding the storage of electrical charge:

- The charge stored in a fully charged capacitor is the product of its capacitance and the voltage applied
- Capacitance increases with decreasing plate separation
- In a direct current circuit a capacitor discharges
- In an alternating current circuit a capacitor charges and discharges
- A charged capacitor has a potential difference across it

Reminder

- Capacitors are key circuit components in many implantable and non-implantable medical devices.

Did you know?

- Supercapacitors, with the ability to store enormous amounts of electrical energy, have their conducting plates made out of graphene.
- Graphene consists of a single layer of atoms arranged in a 2D honeycomb lattice and is the thinnest and most conductive material known to science.

2. Regarding defibrillators:

- The better the electrical contact with the patient's skin the less chance of burns to the skin
- Electrodes applied directly to the heart during cardiothoracic surgery require higher energy shocks
- Biphasic defibrillators deliver higher currents and thus more effective shocks than monophasic defibrillators
- The capacitor in a defibrillator is charged with an alternating current
- Synchronised defibrillators deliver a shock in concordance with the P-wave on the ECG

Pointer

- See *Figures 21.4* and *21.5* for the circuit in a defibrillator and the current discharge in monophasic and biphasic modes, respectively.

3. Regarding pacemakers:

- Pacing leads allow for the measurement of depolarization of the myocardium by using two cathodes
- Pacemakers record electrograms
- Dual chamber pacing systems measure AV delays
- Ventricular pacing modes are most commonly used in second and third degree heart block
- The pacing threshold is the minimum voltage required to cause depolarization of the heart

Did you know?

- John A McWilliam published 'Electrical Stimulation of the Heart' in 1889 where he proposed both the concepts of cardiac pacing and also cardiac resuscitation following 'fatal syncope'.

Single best answer questions

For each of the following questions, select the single best answer – note that more than one answer may be true but only one option represents the best answer

1. Elective synchronized DC cardioversion is indicated in:

- a. Ventricular fibrillation
- b. Torsades de pointes
- c. Complete heart block
- d. Atrial fibrillation with haemodynamic instability
- e. Ventricular tachycardia without haemodynamic instability

Reminder

- Deliver an emergency shock (200–360 J) in any arrhythmia associated with life-threatening haemodynamic instability.

2. Which of these ECG leads are classed as unipolar and measure activity in the frontal plane?

- a. Leads I, II, III, V1–V6
- b. Leads aVR, aVL, aVF
- c. Leads aVR, aVL, aVF, V1–V6
- d. Leads V1–V6
- e. Leads I, II, III, aVL, aVF

Reminder

- Electrical activity in the transverse plane is measured by the precordial leads.
- Electrical activity in the frontal plane is measured by the limb leads.

Did you know?

- The term unipolar, first introduced by Wilson and Goldberger, is a misnomer.
- No leads can be truly 'unipolar' as they all require positive and negative poles.

3. Which single 'GABAergic' anaesthetic agent would you expect to give the lowest bispectral analysis reading?

- a. Ketamine
- b. Desflurane
- c. Nitrous oxide
- d. Isoflurane
- e. Dexmedetomidine

Did you know?

- The BIS algorithm was developed mainly from EEGs during use of 'GABAergic' anaesthetic agents (e.g. isoflurane, sevoflurane, desflurane and propofol).
- There is less evidence supporting the relationship between the depth of anaesthesia and BIS values when using 'non-GABAergic' agents (e.g. ketamine, xenon, nitrous oxide and dexmedetomidine).
- For example, ketamine has been found to increase BIS values and nitrous oxide to have no effect.

Answers to questions for Chapter 21 – Electrocardiography, pacing and defibrillation

Multiple true / false questions

The following answers are true:

1. a, b, d and e
2. a
3. b, c and e

Single best answer questions

The options below represent the single best answer, although other options may also be true:

1. e
2. b
3. d