Exam No. | |

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MCQ Examination for the

Membership of the College of Anaesthetists of Ireland

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Subject: Sample Paper 4- SBA

TIME ALLOWED 90 MINUTES

- This booklet must not be taken from the Examination Hall
- There are 40 questions with 5 options on the paper
- Each question may be TRUE or FALSE
- Therefore you should have 200 responses by the end of the exam
- Allow enough time to fill out the Optical Mark Answer Sheet
- Please use the pencil provided only
- Please keep the answer sheet dry and do not fold the answer sheet
- There is no negative marking in this examination
- No mark is awarded for an answer left blank
- Candidates should answer all the questions

Example Anatomy Questions

Q1. A 72-year-old man complains of numbness in his feet and difficulty walking. On examination he has normal pain and temperature sensation in his lower limbs, but decreased appreciation of light touch and proprioception.

Which of the following is the most likely site of a neurological lesion?

A. Dorsal columns

B. Dorsal horn grey matter

C. Lateral corticospinal tracts

D. Lateral spinothalamic tracts

E. Spinocerebellar tracts

Q2. A 45-year-old woman is undergoing an ankle fusion under general anaesthesia. As part of your postoperative analgesia plan, you decide to perform ultrasound guided combined popliteal and saphenous nerve blocks.

With regard to the saphenous nerve, which of the following is correct?

A. It has a connection with the superficial peroneal nerve

B. It innervates the medial aspect of the lower leg to the first metarsopharyngeal joint

C. It is the only nerve in the adductor canal

D. The saphenous nerve is a mixed motor and sensory nerve

E. This nerve is a terminal branch of the sciatic nerve

Example Statistics Questions

Q1. A randomised prospective double-blind study is undertaken to determine the efficacy of a new drug to treat hypertension. 460 newly diagnosed hypertensive patients are assigned either to the treatment or placebo group. Measurements of arterial blood pressure are made after three months.

Which of the following statistical tests is most appropriate to determine whether the systolic blood pressure in the active treatment group is significantly lower than that in the placebo group at three months?

A. Chi-squared analysis

B. Fisher's Exact Test

C. Mann Whitney U-test

D. Student's unpaired t-test

E. Wilcoxon matched pairs test

Q2. Skin prick testing can be used to aid the diagnosis of allergy to neuromuscular blocking agents. There are however true negative, true positive, false positive and false negative results.

How can the sensitivity of these predictive tests be calculated?

A. True negatives / (true negatives + false negatives)

B. True negatives / (true negatives + false positives)

C. True positives + true negatives / total

D. True positives / (true positives + false negatives)

E. True positives / (true positives + false positives)

Example Pharmacology Questions

Q1. In a clinical trial of a new intravenous induction agent, the plasma concentrations of this drug are taken at regular time intervals following a bolus.

The following data are acquired:

Time following injection (Hours)	Plasma concentration (micrograms.ml^{-1})
2	400
6	100
10	25
14	6.25

From these measurements which one of the following options approximates best to the plasma half-life ($T_{½}$) of the drug?

A. 1 hour

B. 2 hours

C. 4 hours

D. 8 hours

E. 10 hours

Q2. A 35-year-old patient presents for surgery with peritonitis secondary to acute appendicitis. The surgeon asks you to administer a dose of metronidazole.

Which of the following mechanisms best explains the antibiotic action of metronidazole?

A. Interferes with bacterial cell wall synthesis

B. Interferes with bacterial DNA synthesis

C. Interferes with bacterial energy metabolism

D. Interferes with bacterial protein synthesis

E. Interferes with bacterial RNA synthesis

Q3. A neuromuscular blocking agent has the following pharmacodynamic properties:

- Effective dose 95 (ED95) - 0.3 $mg.kg^{-1}$
- Time to 95% depression of first twitch of train of four (ToF) - 75 seconds
- Time to 25% recovery of first twitch of train of four (ToF) - 33 minutes.

Which of the following options best describes this neuromuscular blocking agent?

A. Can be reversed by a modified gamma-cyclodextrin

B. Has a benzylisoquinolinium structure

C. Has a metabolite that contributes to its neuromuscular blocking activity

D. Is less lipohilic than vecuronium

E. Is the neuromuscular blocker of choice for a rapid sequence induction

Q4. An intravenous infusion of a drug is commenced at a rate of 20 ml/hour. The concentration of the drug in the syringe is 5 mg/m. The plasma clearance of the drug is 20 L/hour.

Which of the following values best approximates to the plasma concentration of the drug at steady state assuming that the infusion rate remains unchanged?

A. 5 $\mu g.ml^{-1}$

B. 5 $mg.ml^{-1}$

C. 50 $\mu g.ml^{-1}$

D. 50 $mg.ml^{-1}$

E. 500 $\mu g.ml^{-1}$

Q5. A new volatile anaesthetic agent has become available for clinical use. It is a sweet-smelling, non-irritant substance. It has a molecular weight of 170, a blood:gas partition coefficient of 0.6 and an oil:gas partition coefficient of 180. Two percent is metabolised by an oxidative pathway to trifluoroacetic acid.

Which of the following statements best fits the pharmacological profile of this agent?

A. It has a lower MAC than halothane

B. It has a lower molecular weight than isoflurane

C. It has a slower wash-out than enflurance

D. It is less likely to cause hepatotoxicity than sevoflurane

E. It is less suitable for an inhalational induction compared with desflurane

Example Physiology Questions

Q1. A 1 litre intravenous bolus of 20% albumin is given to a normally fit and well 20-year-old male over a period of 10 minutes.

Which one of the following primary physiological responses is most likely to influence a change in the urine output in this patient?

A. Inhibition of antidiuretic hormone (ADH) secretion

B. Osmotic diuresis

C. Stimulation of atrial natriuretic peptide (ANP) secretion

D. Stimulation of carotid sinus baroreceptors

E. Stimulation of renin secretion

Q2. A hormone is produced in the cytoplasm of an endocrine cell and is then stored in granules within the cytoplasm. On release from the cell it is carried in the blood- stream to a target cell, where it acts at the cell membrane by second messengers.

Which hormone is best described in these terms?

A. Adrenaline

B. Aldosterone

C. Growth hormone

D. Thyroid-stimulating hormone

E. Thyroxine

Q3. A fit 30-year old experiences a vaso-vagal attack at the sight of a needle used for taking a blood test.

Which of the following receptors is primarily responsible for his collapse:

A. Muscarinic receptors in the nucleus accumbens

B. Nicotinic receptors at the skeletal neuromuscular junction

C. Nicotinic receptors in the tractus solitarius

D. Post-ganglionic muscarinic receptors in the heart

E. Pre-ganglionic nicotinic receptors within the parasympathetic ganglion

Q4. A 31-year-old woman trampled by a horse sustains multiple injuries including a pelvic fracture. She appears to have lost a significant volume of blood.

The first physiological compensatory mechanism for the acute blood loss is:

A. Anti diuretic hormone (ADH) release

B. Cortisol release

C. Reduced baroreceptor activity

D. Renin – angiotensin – aldosterone system activation

E. Sympathetic nervous system stimulation

Q5. Oxygen delivery to the tissues (oxygen flux) increases during normal pregnancy.

Which of the following is the most important reason for this?

A. Increased myocardial contractility

B. Increased haematocrit

C. Increased PaO_2

D. Increased venous return

E. Shift of the oxygen-haemoglobin dissociation curve

Q6. A researcher is studying factors affecting skeletal muscle metabolism at rest under normal conditions of oxygen delivery in a laboratory setting.

Under these circumstances, which one of the following contributes most to energy production:

A. Anaerobic glycolysis

B. Creatine phosphorylation

C. Glycogenolysis

D. Oxidation of NADH

E. Oxidative phosphorylation

Example Physics and Clinical Measurement Questions

Q1. A patient is anaesthetised for an elective hemicolectomy for adenocarcinoma. The surgeon uses unipolar diathermy during the case. At the end of the case, nursing staff reports to you that the patient has sustained a burn where the neutral plate was placed.

The most accurate reason for this is?

A. The patient was touching a metal lithotomy pole

B. The neutral plate was incorrectly placed

C. The patient has a pacemaker

D. The neutral plate was not placed

E. Use of alcoholic skin prep

Q2. A 44-year-old woman is being anaesthetised for a laparoscopic cholecystectomy. During maintenance of anaesthesia she is being ventilated via a circle system with a fresh gas flow (FGF) of 1.2 L/min (oxygen / air / desflurane). The capnograph trace has a normal shape.

The following table shows changes to the end-tidal and baseline carbon dioxide measurements of the capnograph at 5 and 25 minutes.

	5 minutes	**25 minutes**
End tidal CO_2	4.5KPa	7.8KPa
Baseline end tidal CO_2	0.2KPa	1.9KPa

Heart rate is 100-105 beats per minute, systolic blood pressure 120-133 mmHg and SpO_2 is 99%.

What is the single most important immediate course of action to take?

A Check the patient's core temperature

B Increase the fresh gas flow

C Increase the minute volume

D Recalibrate the capnograph

E Replace the sodalime

Q3. You are asked to review a patient in the intensive care unit with hypotension. When you review the arterial waveform, you deduce that it is damped thus giving rise to inaccurate blood pressure interpretation.

Which one of the following statements corresponds to the readings taken from a damped arterial waveform?

A. The systolic and diastolic pressures are lower with the same mean

B. The systolic pressure and diastolic pressure are higher with a higher mean

C. The systolic pressure and diastolic pressure are lower with a lower mean

D. The systolic pressure is higher and the diastolic pressure is lower with a normal mean

E. The systolic pressure is lower and the diastolic pressure higher with the same mean

Q4. Heat and moisture exchangers (HME) have a typical pore size of 0.2 µm. They have the ability to filter out bacteria and viruses that are smaller than 0.1 µm in diameter.

Which of the following mechanisms of "particle capture" are most appropriate for most bacteria and viruses?

A. Diffusion

B. Electrostatic attraction

C. Interception

D. Inertial impaction

E. Sieve

Q5. You are about to preoxygenate a 43-year-old male patient with a BMI of 39 $kg.m^{-2}$, prior to rapid sequence induction of anaesthesia. You have a fresh gas flow of 6 litres per minute oxygen and a good seal on the facemask. You are watching the end-tidal oxygen percentage until this is more than 90%.

Which of the following is the most efficient method of preoxygenating this man:

A. A Bain breathing system, with the patient supine

B. A Bain breathing system, with the patient sitting up at 30 degrees

C. A Mapelson A breathing system, with the patient supine

D. A Mapelson A breathing system, with the patient sitting up at 30 degrees

E. An Ayre's T - piece