The Royal College of Pathologists

MRCPath Part 1 written examination in Clinical Embryology

Paper 1: Essay questions

Paper 1 is a three hour essay paper. Candidates will be required to write four essays from a choice of five questions. The questions will provide candidates with the opportunity to demonstrate the breadth of their knowledge upon particular topics and their ability to construct and organize an argument and present it logically and clearly.

Please note, the College's 'closed' marking scheme for essays, as described in the 'Regulations and Guidelines' document, means that it is better to strive for four overall good answers, than one or two exceptionally good and other lesser quality answers.

Paper 2: Short Answer Questions

Paper 2 consists of 20 compulsory Short Answer Questions (SAQs), to be answered in three hours. SAQs are designed to test factual knowledge and understanding across a broad range of areas. Each question comprises a stem and approximately six sub-questions. The stem defines the topic of the question and may include a short scenario. Each sub-question is designed to elicit a specific piece of information, or demonstration of understanding of the topic and its context. Unless stated otherwise, the answer required will relate specifically to the material provided in the stem and not to the topic in general.

Points to note:

- SAQs are criterion-marked against an explicit model answer
- Marks are only awarded for information required by the question – no marks are available for additional material
- If a defined number of facts are requested (e.g. State **two** causes of .....), only that number of responses will be marked (e.g. Answer – *correct cause, incorrect cause, correct cause,* will only receive one out of two marks).
- Answers requiring more than single word or phrase responses will be answerable in a single sentence or a small number of sentences.

Examiners will be looking for key concepts in these answers and no marks will be awarded for extra information. Candidates should practice writing short, concise answers, which include only the information requested. Good use of English, avoidance of abbreviations, and clear handwriting are, however, essential. Candidates who write unnecessarily long answers are likely to penalise themselves because these answers waste time.

The mark allocation for each SAQ sub-question is stated in brackets.
Each SAQ paper will undergo a standard setting procedure following which adjusted marks will be aggregated with those from Paper 1, which will comprise four essay questions marked using the College closed marking scheme.

The Royal College of Pathologists

Part 1 examination

CLINICAL EMBRYOLOGY: First paper

SAMPLE

Candidates must answer FOUR questions ONLY

Time allowed – THREE HOURS

1. Summarise the molecular and cellular events occurring in the sperm and the oocyte during the process of fertilisation. Discuss these events with reference to the likely efficacy of clinical strategies designed to overcome defects at the various stages of fertilisation.

2. Discuss the roles of the major constituents of culture medium used for human embryo culture.

3. Briefly describe the effects of cooling upon cells.
   With reference to human embryos, explain how the following contribute to cell survival after cryopreservation:
   (i) the constituents of cryopreservation medium,
   (ii) seeding
   (iii) the rate of cooling.

4. Explain the rationale for the screening tests that sperm donors are required to complete.
   Briefly explain the potential implications of the following for acceptance as a sperm donor.
   (i) Family history of cardiac disease
   (ii) Previous donation abroad
   (iii) Transexual male wishing to donate before gender reassignment.
   (iv) Borderline semen quality

5. Explain how your laboratory practice is affected by the legal and regulatory framework prevailing in UK. You may wish to include one or more of the following as examples:
   Consent
   Witnessing
   Quality management
   Limited duration of frozen storage.

Example Short Answer Questions with model answers

Please note that some of the model answers presented here give more information than is expected of candidates. This has been done in order to provide some explanation of the answers in the examples.

Micromanipulation		
a)	Give two possible indications for intracytoplasmic sperm injection that are not identified from the semen analysis? [2]	Eg: Previous failed fertilisation Oocyte factor (eg thick zonas)
b)	What action would you take if all oocytes were identified as immature after cumulus denudation in preparation for ICSI. [4]	Possible further culture for IVM, especially if GVBD already occurred. Check whether hCG was given Check previous cycles for evidence of oocyte maturity Inform patients if no prospect of injecting on day 0.
e)	What might be the consequences of injecting a motile sperm at ICSI? [4]	Damage to oocyte from sperm movement Slower incorporation of sperm because of intact membrane.
c)	State one advantage and one disadvantage of taking 2 cells from an 8-cell embryo for pre-implantation genetic diagnosis (PGD), in comparison with taking just one cell. [4]	Advantage: 1 of: Increased chance for diagnosis Double amount of dna for analysis Less risk of cell being non-representative Disadvantage: 1 of: more invasive More likely to reduce implantation potential Removes more of embryo.
d)	In each situation below, state whether PGD by fluorescence in situ hybridisation (FISH) would be an appropriate diagnostic method (i) Trisomy 21 Down Syndrome (ii) Translocation (iii) Cystic Fibrosis, deltaF508 mutation? [6]	(i) yes (ii) yes, with careful selection of probes. (iii) no, needs amplification method

Ovarian control and follicular stimulation		
a)	Which two hormones are used in 'hormone replacement therapy' (HRT)? [2]	Oestrogen and Progesterone
b)	Which hormones, administered to stimulate the growth of multiple follicles in preparation for oocyte collection, act directly upon the ovary? [4]	FSH LH or hCG
c)	Which cells produce inhibin in women? [2]	Granulosa cells
d)	What are the characteristic features of the ovary in a patient with polycystic ovarian syndrome? [4]	Multiple small peripheral follicles, not growing. Central stroma Increased blood blow by Doppler.
e)	What is meant by 'pituitary down-regulation' in the context of ovarian stimulation programmes? [4]	Pituitary is no longer responsive to GnRH stimulation, due to the action of a long acting GnRH agonist.
f)	Explain how oestrogen assays may be used to detect incipient ovarian hyperstimulation syndrome. [4]	Oestrogen is produced by growing follicles, excess oestrogen indicates high number of growing follicles. Assays can assess extent of follicle recruitment and repeat assays can detect whether situation is improving or worsening.

Legal and ethical considerations		
a)	List two situations where it is a requirement for those concerned to speak to a counsellor [2]	Sperm or egg donor/recipient Surrogacy
b)	A man aged 42, about to start treatment for cancer, wishes to store sperm for his own use in future. For how long may it be stored? [4]	To age 55 or 13 years.
c)	What issues arise, in relation to assessing the welfare of a child to be born through IVF, where the prospective father is in prison? [4]	Access of child to his/her father Nature of offence (violent? harm towards children?, drug abuse?) Relationship with mother/family home Support structure around lone mother
d)	A man has split up with his wife and wishes to avoid her using the frozen embryos they created during treatment together. The embryos were created using donor sperm. What would you advise this man to do? [4]	He should withdraw consent to being considered the partner of the woman, but he cannot require disposal of the embryos as they are not his genetic material. His ex-wife could still use them, subject to donor agreement, as a single woman, or with another partner, subject to appropriate consent forms.
e)	There has been a mistake and a letter intended for the General Practitioner (GP) of a patient has been sent to another GP of the same name, by accident. Explain why this is considered a breach of the Act? [2]	Breaches confidentiality of patient
f)	You are introducing a new method in the lab, and want to randomise patients' embryos between two media, to see which is most effective. Whose approval do you need? [4]	Local Research Ethics Committee (as this is a trial where randomisation/allocation is involved) Hospital Research and Development body (eg to ensure that hospital indemnity covers the activity). Patients (as this represents a change from normal protocol). HFEA approval not required unless the trial uses methods that would not be normal in treatment (eg fixing and staining embryos instead of discard at end of procedure).

Quality Management		
a)	State four examples of key performance indicators (KPI) used in the IVF laboratory? [4]	Eg, fertilisation rate, pregnancy rate with gold standard patients, individual ICSI fertilisation rate, good quality embryo rate, multiple pregnancy rate, early cleavage rate, used or cryopreserved embryo rate…
b)	For two KPIs named above, provide approximate ranges of acceptable tolerances and state what action you would take if results fell outside your acceptable range? [4]	Eg, fertilisation rate for ICSI might be avg 66% (range 61-71) Action if results outside range to check notes and dataset for reasons, alert staff and improve awareness. Take appropriate action (eg retraining, further monitoring, change reagents) as appropriate.
c)	You identify that an incubator is not recovering properly from door opening. How would this be evidenced and what action would you take? [4]	Prolonged slow return of gas to required level. Check supply vessels/valves/change if necessary. Monitor further Take out of use until meeting acceptable criteria.
d)	One of your liquid nitrogen storage tanks is using more nitrogen than the others. What might be the possible reasons? [4]	High level of use/lid opening Incipient tank failure/loss of vacuum. Different design of tank (eg neck diameter)
e)	How would you check the identity of a patient who you needed to telephone to discuss fertilisation results? [4]	At least two identifiers, ideally one that only the patient would know, eg hospital no. or agreed code word.