



The Royal Australian and New Zealand
College of Radiologists®

Candidate Number: _____

The Faculty of Radiation Oncology

FRANZCR Examination

Phase 2 Radiation Oncology

Pathology

February 2022

Time Allowed: 3 Hours

INSTRUCTIONS

ALL QUESTIONS are to be attempted.

There are a total of SIX (6) questions.

All questions are of equal value.

The marks allocated to each subpart is indicated in brackets.

Hand **all** papers to the invigilator.

No papers are allowed to be taken from the examination room.

THIS INCLUDES THE QUESTION PAPERS.

Question 1

- a.** A 65-year-old man underwent a cystoscopy and TURBT for suspected bladder cancer. **(2.5)**
- i.** List the findings that should be included in the cystoscopy and histopathology reports.
 - ii.** List the common immunohistochemical stains used to identify urothelial carcinoma.
- b.** List the risk factors for the development of carcinoma of the bladder. **(2)**
- c.** Describe 2 potential pathogenesis pathways for the development of multifocal bladder cancers. **(3)**
- In what other tumour sites can this phenomenon occur?
- d.** Regarding squamous cell carcinoma of the bladder, describe the: **(2.5)**
- i.** Potential pathogenesis.
 - ii.** Biological behaviour, in comparison to urothelial carcinoma.

Question 2

- a.** A 56-year-old female presents with bitemporal hemianopia. An MRI demonstrates a mass in the sellar region. **(1)**
- List the differential diagnoses for a lesion arising in the sellar region.
- b.** Compare pituitary tumours arising from lactotrophs and corticotrophs in regard to: **(2)**
- i.** Clinical Symptoms.
 - ii.** Laboratory Findings.
- c.** Regarding pituitary adenoma, what pathologic features may predict more aggressive behaviour following surgical resection? **(1)**
- d.** What is the pituitary 'stalk effect' and what is the relevance to pituitary adenoma subtype? **(1.5)**
- e.** For both MEN1 and MEN2 outline: **(2)**
- i.** Genetic mutation.
 - ii.** The associated tumours.
- f.** For medullary carcinoma of the thyroid gland, briefly describe the: **(2.5)**
- i.** Cell of origin.
 - ii.** Microscopic and immunohistochemical features.
 - iii.** Clinical and pathological features that may indicate an underlying germline mutation.

Question 3

- a.** A 65-year-old builder presents with chest pain and is found to have pleural plaques confirmed on biopsy to be Mesothelioma.
- i.** List five risk factors for mesothelioma. **(0.5)**
 - ii.** Describe the main histological subtypes of mesothelioma. **(1)**
- b.** Using immunohistochemistry, how can you differentiate between adenocarcinoma, mesothelioma and small cell lung cancer? **(3)**
- c.** Lung cancers can be associated with paraneoplastic syndromes. **(1)**
- i.** Define “paraneoplastic syndrome”.
 - ii.** How are these syndromes mediated?
- d.** Write brief notes on the following para-neoplastic syndromes: **(4.5)**
- i.** Hypercalcaemia.
 - ii.** Carcinoid syndrome.
 - iii.** SIADH.

Include in your answer for each the commonly associated malignancies and causal mechanisms to support the diagnosis (where applicable).

Question 4

- a.** List the risk factors for the development of cutaneous melanoma. **(2.5)**
- b.** List the pathological features that should be on a synoptic report for excision of a cutaneous melanoma and sentinel node biopsy. **(2.5)**
- c.** Regarding Lentigo Maligna or Hutchinson's Melanotic Freckle, describe its: **(2.5)**
- i.** Epidemiology and common locations.
 - ii.** Macroscopic appearance.
 - iii.** Biological behaviour.
- d.** Describe the BRAF signalling pathway and its significance in the development of cutaneous melanoma. **(2.5)**

Include in your answers the incidence of BRAF mutations and list its two most common variants.

A diagram may be used.

Question 5

- a. A 50-year-old female presents with a cystic lump at the angle of the mandible on the right (level IIA).
- i. List the potential differential diagnoses. **(0.5)**
 - ii. List the presenting clinical features which would be highly suggestive of this being a malignant mass lesion. **(0.5)**
- b. In diagnosing parotid salivary gland tumours, briefly discuss the role of:
- i. Fine needle aspiration cytology. **(1)**
 - ii. Core biopsy. **(0.5)**
- c. Regarding Pleomorphic Adenoma vs. Warthin's Tumour
- In a table format, compare and the contrast the following:
- i. Clinical features. **(1)**
 - ii. Biological behaviour. **(1)**
 - iii. Describe the microscopic features of **Pleomorphic Adenoma**. **(1)**
- d. Regarding Mucoepidermoid Carcinoma vs. Adenoidcystic Carcinoma:
- In a table format, compare and the contrast the following:
- i. Epidemiological and clinical features. **(1)**
 - ii. Pathological features (Macroscopic and Microscopic). **(2)**
 - iii. Biological behaviour. **(1.5)**

Question 6

- a.** A 70-year-old female presents with a mass on the left vulva. **(1)**
List the histological subtypes of vulval malignancies.
- b.** List the risk factors for squamous cell carcinoma of the vulva. **(1)**
- c.** List the precursor lesions for the development of vulvar squamous cell carcinoma. **(2)**
- d.** Describe the two proposed pathways for the development of squamous cell carcinoma of the vulva. **(3)**
- e.** Discuss the specific advantages and disadvantages of SLNB when used in the management of vulva cancer. **(3)**



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Question 1

- a.** A 60-year-old woman with a past history of early breast cancer presents with back pain. Staging investigations show bone confined metastases. **(3)**

What factors would you consider in determining a management plan for her and why?

- b.** The patient is fit and has widespread bone metastases. She is symptomatic at the T10 site. There is no spinal instability, spinal cord compression or previous radiation at the site. **(3)**

What are her options for radiation therapy treatment? Justify your answer and provide likely response rate for each option.

- c.** **(4)**

- i.** In the setting of bone only metastatic disease, discuss the different classes of systemic therapy available for use.

Include in your discussion of each:

- 1.** The rationale/considerations for use of this class.
- 2.** Give one example of a drug within the class.

- ii.** In general, what factors do you consider when advising the medical oncologist whether there needs to be a break in the systemic treatment when palliative radiation is delivered?

Question 2

- a.** Discuss the management of T1 (localised tumour < 7cm) renal cell carcinoma. **(2)**
- b.** Radiation can be utilised in the management of metastatic renal cell carcinoma. **(3)**
- i.** Define the abscopal effect.
 - ii.** Discuss at a cellular level, how the radiation induces the abscopal effect.
 - iii.** Describe how the abscopal effect can be enhanced.
- c.** Describe the side effects commonly associated with immunotherapy and how they are managed. **(2)**
- d.** What are the classes of immunotherapy and how do they work? **(3)**
- Give an example of each type.

Question 3

- a.** A 70-year-old male with stage 4 lung cancer presents with shortness of breath. **(2)**

- i.** List the possible causes of shortness of breath in this patient.
- ii.** Describe your initial assessment and investigations.

- b.** The patient deteriorates quickly, and it is decided to place him onto an end-of-life pathway. **(2)**

What strategies can be used to manage breathlessness in this patient?

- c.** A fit 65-year-old female with metastatic breast cancer presents with severe pain in the lumbar spine from a metastasis. **(4)**

Discuss the pharmacological pain management options for this patient.

Include the rationale behind each class of drugs and the advantages and disadvantages.

- d.** This patient's pain is refractory to pharmacological measures and has not responded to radiation therapy. **(2)**

Discuss any other potential options.

Question 4

- a.** A 60-year-old woman is referred to you by her GP with a 12cm right pelvic mass noted during a routine unremarkable pap smear examination. **(1)**

List the common presenting symptoms associated with epithelial ovarian cancer.

- b.** What specific features would you look for on a focussed physical examination of this patient? **(2)**

- c.** What investigations would you order on this patient? **(1)**

- d.** Discuss the options for the use of systemic therapy agents in epithelial ovarian cancer. **(6)**

Question 5

- a.** With regards to investigations used in staging prostate cancer, identify a common positron emission tomography/computed tomography (PET/CT) radiotracer. **(3)**

Include in your answer:

- i.** The pathophysiological basis for the action of this radiotracer.
 - ii.** The advantages and disadvantages compared with conventional staging investigations (CT scan and bone scan). Provide evidence where appropriate.
- b.** Outline the treatment modalities used in the management of bone secondaries from prostate cancer. **(7)**

In your answer, include the indications and timing for the use of each modality. Provide evidence where appropriate.

Question 6

- a.** A 6-year-old girl with average risk medulloblastoma undergoes craniospinal radiation with a posterior fossa boost. **(3)**

Outline the discussion you would have with the child's parents about the potential acute and late toxicity of this treatment and the implications for the child in the future.

- b.** How have treatment protocols changed over time to minimise the toxicity from treatment for paediatric patients with medulloblastoma? **(2)**

- c.** What factors must be considered in the long term follow up of this patient in a paediatric cancer survivorship clinic? **(5)**

How would you address these factors?



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FRANZCR Examination

Phase 2 Radiation Oncology

Radiation Therapy 1

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Question 1

- a.** A fit 72-year-old man presents with unsteadiness and headache, after surgery alone for localised lung adenocarcinoma. On imaging, he is found to have a solitary brain metastasis in the right cerebellum measuring 3cm in maximal dimension. His symptoms have mostly resolved with oral steroids. **(3)**

What further information do you require in order to recommend a management plan?

- b.** There is no evidence of disease elsewhere. The patient undergoes macroscopically complete resection of the lesion, and histopathology is consistent with metastatic lung adenocarcinoma, ALK/EGFR/ROS-1 negative, PD-L1 TPS <1%. **(4)**

Compare and contrast the management options following surgery.

Include in your answer relevant information you would use to counsel the patient in making an informed decision.

- c.** The surgical cavity is estimated to measure 3.5cm on postoperative MRI. The decision is made to treat the surgical cavity alone using a linear accelerator. **(3)**

Describe a radiation therapy technique and dose fractionation schedule to treat the surgical cavity alone, including on-treatment localisation.

Question 2

- a.** A well 40-year-old female presents with intermenstrual bleeding. Clinical examination reveals a 5 cm mass arising from the cervix. Biopsy confirms squamous cell carcinoma. **(2)**
- i.** List and explain the components of an Examination under Anaesthetic (EUA).
 - ii.** Discuss the relative benefits of various imaging modalities.
- b.** In general, list the prognostic features that influence local control and survival in cervical cancer. **(2)**
- c.** This patient is diagnosed with a squamous cell carcinoma of the cervix with a 2cm para-aortic lymph node at the level of the third lumbar vertebrae (FIGO Stage IIC2). Definitive chemoradiation is recommended. **(4)**
- For the external beam component describe in detail:
- i.** Target volumes.
 - ii.** Dose fractionation schedule.
 - ii.** Organs at risk.
- d.** List the symptoms, incidence and management of acute and late small bowel toxicity occurring as a result of extended field radiation therapy for cervical cancer. **(2)**

Question 3

- a.** A fit 40-year-old man presents with painless right inguinal lymphadenopathy, enlarging over several months. An excisional biopsy is performed of one of the lymph nodes which confirms follicular lymphoma (Grade 1-2). **(3)**

What further information do you require in order to recommend a management plan?

- b.** What are the indications for active treatment vs observation in patients with follicular lymphoma? **(3)**

- c.** Further investigations reveal lymphomatous involvement of inguinal and distal external iliac lymph nodes only, with the largest node measuring 2cm in short-axis dimension (stage IIA, non-bulky disease). The decision is made to treat this patient with definitive radiation therapy. **(3)**

Describe a suitable radiation therapy technique and dose fractionation schedule.

- d.** What is the expected response and long-term tumour control outcome for this patient? **(1)**

Question 4

- a. A 72-year-old male presents with moderate odynophagia and dysphagia, along with 6kg of unintentional weight loss. He is found to have a right pyriform fossa squamous cell carcinoma measuring 3cm and involved ipsilateral lymph nodes, staged cT2 N2b M0. He has several comorbidities and a long smoking history and is ECOG 2. **(3)**

Discuss the potentially curative treatment options available, including the advantages and disadvantages of each.

- b. Which pre-treatment assessments and investigations would you require in order to recommend a treatment plan? **(2)**
- c. What are the options for voice rehabilitation after total pharyngolaryngectomy? **(1)**
- d. The patient has a pharyngolaryngectomy and right neck dissection and makes an uneventful recovery. **(4)**

Histopathology reveals a 25mm primary tumour of the right hypopharynx posterior wall, and two lymph nodes involved in right level III measuring 20 and 10mm respectively, with no extracapsular spread. All margins are clear.

The patient presents for postoperative radiation therapy. Describe a suitable radiation therapy technique and dose fractionation schedule.

Note: No organ at risk constraints are required for this section.

Question 5

- a.** An otherwise well 58-year-old man presents with chest pain. CT demonstrates a mass at the apex of the left lung, invading the first and second ribs anteriorly. Core biopsy confirms squamous cell carcinoma (SCC). **(2)**

What specific aspects of clinical examination and investigations would allow you to determine the best management plan for this patient?

- b.** His disease is localised to the primary only and the tumour is deemed resectable. **(2)**

What are the available treatment options for this patient?

- c.** The decision is made to proceed with neoadjuvant chemoradiotherapy prior to surgical resection. **(6)**

Discuss the benefits of preoperative over postoperative treatment.

Include in your discussion:

- i.** Evidence for preoperative chemoradiation.
- ii.** A suitable dose fractionation schedule and chemotherapy schedule.
- iii.** Timing of surgery.
- iv.** Expected outcome from treatment.



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Radiation Therapy 2

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Question 6

- a.** A fit 55-year-old man presents with borderline resectable node positive adenocarcinoma of the neck of pancreas. **(1)**

What treatment strategies would you consider for this man?

- b.** The patient has chemotherapy. Restaging shows stable disease. The decision is made to proceed with preoperative concurrent chemoradiation. **(3)**

Describe a suitable radiation therapy technique and dose fractionation schedule. Include a suitable chemotherapy regimen.

- c.** How would you describe to a patient the process involved in delivering SABR to the pancreas? **(3)**

Specifically address:

- i.** Simulation.
- ii.** Treatment.
- ii.** Potential side effects.

- d.** Discuss the advantages and disadvantages of using SABR for the treatment of pancreatic cancer when compared with conventionally fractionated EBRT. **(3)**

Question 7

- a.** A 73-year-old man with a history of oligometastatic colorectal cancer presents with thoracic back pain. **(1)**

MRI demonstrates a large metastasis in the body of T10 with no encroachment into the thecal sac. He received radiation to a dose of 20Gy in 5 fractions to the same site two years ago.

What are his options for treatment?

- b.** What factors would you consider when recommending management? **(2)**

- c.** The decision is made to re-irradiate using stereotactic body ablative radiotherapy (SABR). **(2)**

What are the main risks of this and what would you discuss with him in the consenting process?

- d.** How would you mitigate risk at the planning and treatment stages? **(3)**

- e.** What are the components of the Spinal Instability Neoplastic Score (SINS) score and how is it interpreted? **(2)**

Would your recommendation change if he had a high SINS score?

Question 8

- a.** What are the two hypothetical mechanisms of radiation that can be exploited for the treatment of benign disease? Give two examples of each. **(2)**

- b.** Discuss the role of radiation in sialorrhoea (i.e., chronic and excessive salivation). **(2)**

Include in your answer a discussion on technique, dose fractionation schedule and response rate.

- c.** Discuss the role of radiation for gynaecomastia caused by androgen deprivation therapy. **(3)**

Include in your answer a suitable technique, dose fractionation schedule and response rate. What other alternatives to radiation exist?

- d.** Discuss the role of radiation in the management of thyroid eye disease. **(3)**

Include in your answer:

- i.** A suitable technique, dose fractionation schedule, response rate.
- ii.** The potential long term consequences of using radiation to treat thyroid eye disease.

Question 9

- a.** A 23-year-old male with Acute Myeloid Leukaemia (AML) is referred for Total Body Irradiation (TBI). **(1.5)**

Discuss the rationale for the use of TBI in AML.

- b.** A decision is made to administer TBI using an opposed lateral technique. **(5)**

Describe this radiation technique and include an appropriate dose fractionation schedule.

- c.** Which other treatment approaches may be used to achieve the same benefit and conventionally fractionated TBI? **(3.5)**

What are the advantages and disadvantages of these approaches?

Question 10

- a.** A 72-year-old man presents with haematuria and a 4cm left bladder wall mass. **(4)**
He proceeds to transurethral resection and is shown to have localised muscle invasive urothelial cancer staging reveals no distant metastatic disease.

His case is discussed at the MDT and you are asked to give an opinion regarding suitability for bladder preservation treatment.

- i.** What other information would you need before giving your opinion? Justify your answer.
 - ii.** Your opinion is that this patient would be a good candidate for a bladder preservation approach. Justify to the MDT why the patient should be given an option to choose between surgery and bladder preservation.
- b.** **(1.5)**
- i.** What is the expected 5-year overall survival following treatment for muscle invasive bladder cancer?
 - ii.** Discuss the difficulties that arise when comparing survival outcomes between radical cystectomy and bladder preservation treatment approach.
- c.** When discussing bladder preservation treatment with the patient, outline what you would tell them about the likely outcomes of treatment in terms of local control and salvage treatments. **(2)**
- d.** Discuss the ways in which radiation dose to adjacent small bowel can be minimised while minimising the risk of geographical miss during the delivery of definitive radiation to the bladder. **(2.5)**