The Royal Australian and New Zealand College of Radiologists®

The Faculty of Radiation Oncology

**Candidate Number:** _____

# FRANZCR Examination

# Phase 2 Radiation Oncology

**Pathology**

**February 2019**

**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 sub-part of the questions are 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 65 year old patient previously well but with a background history of smoking, presents with painless haematuria. An ultrasound examination of the renal tract reveals a 3.5 cm irregular space occupying lesion arising from the left lateral wall of the urinary bladder raising suspicion of this being neoplastic. No other abnormalities are seen.

**a.** What investigations would you undertake in this patient? **(2)**

**b.** Histology from the biopsy confirmed an invasive urothelial carcinoma. **(3)**

List the key features that should be included in the report.

**c.** Describe the pathogenesis of urothelial carcinoma of the bladder. Include in your answer: **(2)**

**i** Proposed mechanisms for multifocality.

**ii** Pathways of pathological evolution of disease.

**d.** Regarding Squamous cell carcinoma of the urinary bladder: **(3)**

**i** List the risk factors.

**ii** Describe the pathogenesis.

## Question 2

**a.** Describe the four major steps in the development of HPV related cervical cancer. **(2)**

**b.** Describe the role of E6 and E7 proteins in the molecular pathogenesis of HPV related squamous cell carcinoma of the cervix. **(4)**

**c.** For invasive carcinoma of the cervix:

**i** What is the frequency of the 2 most common subtypes of HPV infection in squamous cell carcinoma and adenocarcinoma? **(1)**

**ii** What are the possible causative factors for the increase in adenocarcinoma of the cervix? **(1.5)**

**d.** List the salient features to be included in the synoptic histopathology report after a radical hysterectomy for the primary tumour. **(1.5)**

## Question 3

**a.** A 42 year old presents with a seizure. CT brain shows a 5 cm right frontal mass. **(1)**

What are the differentials?

**b.** Describe the MRI findings, microscopic and molecular features that differentiate Oligodendroglioma from a Glioblastoma. **(5)**

**c.** Name and describe 4 commonly seen molecular markers in glioblastoma. Outline their significance. **(4)**

## Question 4

**a.** 35 year old female with chronic cough, CT chest shows mediastinal lymphadenopathy with a hilar mass. Biopsy shows carcinoma. **(5)**

Using a table compare and contrast the macroscopic, microscopic and immunohistochemical features that differentiate Non Small Cell Lung Adenocarcinoma and Small Cell Lung Cancer.

**b.** For lung adenocarcinomas what are the commonly tested molecular/genomic changes and what is their significance? **(2)**

**c.** 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. **(1)**

**ii** Describe the main histological subtypes and immunohistochemistry of mesothelioma. **(2)**

## Question 5

**a.** A 50 year old man presents with nasal obstruction and rhinorrhoea. **(2)**

Clinical examination and imaging demonstrate a mass lesion of the right ethmoid sinus and superior portion of the nasal cavity.

List the differential diagnoses.

**b.** A biopsy is performed and shows small round blue cells. **(2)**

What Immunohistochemical (IHC) profiles would help establish the final diagnosis?

**c.** A diagnosis of sinonasal undifferentiated carcinoma (SNUC) is made. **(1.5)**

What is the natural history of this condition?

**d.** Regarding Adenoid cystic carcinoma. **(3)**

Outline the:

**i** Natural History.

**ii** Histological Features.

**e.** Regarding inverted sinonasal papilloma. **(1.5)**

Outline the:

**i** Epidemiology

**ii** Natural History

## Question 6

**a.** List the main classes of tumour antigens and provide one example for each class. **(2)**

**b.** Briefly describe the ways in which our immune system can prevent the development of cancer? **(1.5)**

**c.** How do cancers escape host immune response? **(3)**

**d.** Describe the mechanism of action of the following immune checkpoint inhibitors and how it leads to tumour control: **(2)**

**i** Ipilimumab

**ii** Pembrolizumab.

**d.** What are the pathological and molecular characteristics of head and neck squamous cell carcinomas that make them ideal for immune checkpoint blockade? **(1.5)**

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# FRANZCR Examination

# Phase 2 Radiation Oncology

## Clinical Oncology

## February 2019

**Time Allowed: 3 Hours**

**INSTRUCTIONS**

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## Question 1

An asymptomatic 55 year old man is diagnosed with non-small cell lung cancer (NSCLC). Staging investigations at diagnosis reveal a right peri-hilar 4cm primary tumour with right hilar lymphadenopathy, and a solitary 13mm left cerebellar metastasis on MRI (T2aN1M1b). Lung function tests are within normal limits.

**a.**

**i** What are the management options for this patient? Which would you recommend and justify your answer. **(6)**

**ii** Discuss systemic therapies which may be useful for treating brain metastases in NSCLC. **(4)**

## Question 2

A 65 year old woman is referred with bone pain and hepatomegaly. An ultrasound of the liver and a whole body bone scan demonstrates multiple metastases in liver and bone. Fine needle aspiration biopsy of a liver metastasis demonstrates adenocarcinoma of no specific type. The patient has a performance status of ECOG 1.

**a.** How would you further assess the patient? Justify your answer. **(3.5)**

**b.** For this woman describe the potential value of tumour markers in the diagnosis and management of Adenocarcinoma of Unknown Primary (ACUP). **(1.5)**

**c.** In general, what prognostic factors are associated with favourable outcome in patients with a confirmed ACUP. **(2)**

**d.** Immunohistochemistry performed on the liver biopsy specimen is non-contributory. **(1)**

For this woman, what are suitable cytotoxic combinations?

**e.** What are the toxicities associated with Taxanes? **(2)**

## Question 3

**a.** Delirium is common in patients with advanced cancer. Describe the diagnostic features of delirium. **(2)**

A 60 year old male presents with features of delirium 3 months after completing a radical course of chemoradiation for a locally advanced non small cell lung cancer.

**b.** Outline your initial assessment and give reasons for relevant investigations. **(2)**

**c.** Restaging demonstrates extensive hepatic, pulmonary and cerebral metastases. **(2)**

Discuss the role of whole brain irradiation in this patient and justify your answer.

**d.** In general, outline your management of a patient with delirium secondary to:

**i** Hypercalcaemia **(2)**

**ii** Terminal Delirium **(2)**

## Question 4

**a.** What is the rationale and possible mechanism of action for the concurrent use of radiation therapy with immunotherapy? **(6)**

In your answer discuss the impact of radiation timing, radiation techniques and dose fractionation.

**b.** What is the pathophysiology behind the main side effects of immune checkpoint inhibitors? Outline the common side effects. **(2)**

**c.** Discuss the evidence that supports the routine use of immunotherapy in the management of melanoma with no BRAF driver mutation. **(2)**

## Question 5

**a.** Discuss the role of radiation therapy in malignant pleural mesothelioma. **(2)**

**b.** Describe the options that are available for the management of pleural effusions in the setting of malignant mesothelioma? **(4)**

What are the advantages and disadvantages of each approach?

**c.** Describe the assessment and management of shortness of breath in a palliative patient. **(4)**

## Question 6

A fit 46 year old female is referred for investigation of a 5cm lesion of the proximal humerus demonstrating full thickness cortical erosion in areas. Biopsy demonstrates a monoclonal plasma cell infiltrate.

**a.** What further investigations would you perform? Justify your answers **(4)**

**b.** In general, what is the role of surgery in the management of solitary bone plasmacytoma (SBP)? **(1)**

**c.** What is the Mirels Scoring System? Include in your answer its components and how it is used? **(3)**

**d.** **(2)**

**i** What is the risk of this patient progressing to multiple myeloma in the next 10 years?

**ii** If the patient progressed to multiple myeloma, what would you discuss with this patient regarding the natural history of the disease with treatment and their prognosis.

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# FRANZCR Examination

# Phase 2 Radiation Oncology

**Radiation Therapy 1**

**February 2019**

**Time Allowed: 2.5 Hours**

## INSTRUCTIONS

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## Question 1

A 22 year old female presents with cough and shortness of breath. A chest x-ray shows a widened mediastinum.

**a.** How would you assess this patient further and what investigations would you perform? **(2)**

**b.** Further investigation confirms a 10 cm mediastinal mass with no evidence of disease elsewhere.

**i** What are the 4 most likely differential diagnoses in this patient? **(1)**

**ii** How will you proceed to obtain histological diagnosis? **(2)**

Biopsy of the mass shows diffuse large B cell lymphoma. The patient is treated with 6 courses of R-CHOP chemotherapy and achieves a complete response.

**c.** Radiation therapy is now recommended for this patient. Describe a suitable radiation therapy technique and dose fractionation schedule. **(4)**

**d.** How would you counsel the patient about screening for breast cancer in the future? **(1)**

## Question 2

A 61 year old female presents with post menopausal bleeding and undergoes radical surgery. The pathology confirms a high grade serous carcinoma of the endometrium extending 24 mm into the 25 mm thick myometrium with spread to bilateral pelvic lymph nodes (including a right common iliac lymph node).

**a.** What factors are important when deciding on further management of this patient? Justify your answer. **(2)**

**b.** Chemoradiation with radical intent is recommended. **(3)**

Describe a suitable radiation therapy technique and dose fractionation schedule.

**c.** Outline the role of chemotherapy in this patient. Justify your answer. Include the chemotherapy agents used. **(2)**

**d.** What advice would you give this patient regarding general lifestyle and minimising treatment morbidity following completion of her treatment? **(1.5)**

**e.** Eighteen months following treatment she presents with bilateral sacral insufficiency fractures without evidence of disease recurrence. **(1.5)**

Outline your management.

## Question 3

An 18 year old female presents with pain in her buttock. Further investigations reveal a 5cm mass arising from the sacrum eroding the bone.

A CT guided biopsy of the mass confirms Ewing Sarcoma.

**a.** What are the challenges and considerations in managing patients of this age? **(2)**

**b.** The tumour is confined to the sacrum. There is no evidence of metastatic disease. **(2)**

What management options are available for this patient?

**c.** A decision is made to offer radiation therapy. Describe a suitable radiation therapy technique and dose fractionation schedule. **(3)**

**d.** The patient is concerned about fertility issues. How will you counsel her and what precautions would you take to minimise the risks? **(2)**

**e.** What are the advantages and disadvantages of treating this tumour with proton beam therapy? **(1)**

## Question 4

A fit 60 year old man presents with epigastric pain and 2kg weight loss. Gastroscopy reveals a 3cm adenocarcinoma of the distal stomach. The patient is being considered for radical therapy.

**a.** What further investigations would you perform? Justify your answer. **(2)**

**b.** The patient has a resectable adenocarcinoma of the stomach. **(5)**

Discuss the treatment options and include the role of postoperative chemoradiotherapy in your discussion.

The tumour is invading into subserosal connective tissue (T3) without obvious lymph node enlargement on preoperative staging.
The decision has been made to give preoperative chemoradiotherapy.

**c.** Describe a suitable radiation therapy technique and dose fractionation schedule. **(3)**

## Question 5

**a.** With intracranial germ cell tumours (ICGCT) in adults, what are the most common symptoms and physical examination findings? **(2)**

**b.** What investigations would you perform on a patient with a suspected ICGCT? Justify your answer. **(3)**

**c.** What radiation therapy volumes and radiation dose would you recommend for adult intra-cranial germinoma vs non germinoma tumours? **(3)**

**d.** In general, what are the long term side effects of craniospinal radiation therapy in children? **(2)**

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# FRANZCR Examination

# Phase 2 Radiation Oncology

**Radiation Therapy 2**

**February 2019**

**Time Allowed: 2.5 Hours**

## INSTRUCTIONS

**ALL QUESTIONS** are to be attempted.

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## Question 1

A 33 year old woman presents with an inflammatory carcinoma of the left breast with palpable axillary lymphadenopathy. The skin changes cross midline and extend below the ipsilateral inframammary fold. Staging shows no distant disease.

**a.** Outline your complete management plan for this patient. **(3)**

The patient is referred for adjuvant radiation therapy following mastectomy and axillary dissection. Surgical margins were clear and there were 6 out of 10 positive nodes in the axilla.

**b.** Describe a suitable radiation therapy technique and dose fractionation schedule. **(3)**

**c.** Your radiation therapist presents a plan with lung and mean heart doses exceeding your dose constraints. What factors would you consider in managing this situation? **(2)**

**d.** **(2)**

**i** What risk of ischaemic cardiac toxicity from radiation therapy would you discuss with this patient? Justify your answer.

**ii** The patient asks about her prognosis. What is the anticipated survival?

## Question 2

A 65 year old man presents with 2 weeks of pain and parasthesia in the right arm. A chest x-ray reveals a 4x3cm mass in the superior sulcus of the right upper lobe. History and examination is unremarkable.

**a.** What investigations would you order? Justify your answer. **(2)**

**b.** Investigations reveal a squamous cell carcinoma of the superior sulcus with no mediastinal node involvement or distant metastatic spread. He is suitable for radical treatment. **(3)**

Discuss the treatment options.

**c.** In this patient, what are the possible contraindications to surgery? **(2)**

**d.** A decision has been made to treat this patient with radical chemo-radiation alone. Describe a suitable radiation therapy technique and dose fractionation schedule. **(3)**

## Question 3

A fit 51 year old male presents with a 2 month history of rectal bleeding and a more recent history of cramping abdominal pain. Sigmoidoscopy and biopsy confirms an adenocarcinoma of the mid rectum through which the scope cannot pass.

**a.** Discuss your initial evaluation of this patient. **(2)**

The patient is clinically staged as having a cT3N2M0 adenocarcinoma of the mid rectum (tumour involves the mesorectal fascia and there are multiple mesorectal and internal iliac nodes). The inferior edge is 6cm above the anal verge.

**b.** Discuss your preferred management plan and justify your answer. **(2)**

**c.** A decision is made to proceed with radiation therapy to the pelvis. Describe a suitable radiation therapy technique and dose fractionation schedule. Justify your answer. **(3)**

The patient has a complete radiological response following neoadjuvant treatment. They have declined definitive surgery.

**d.** How would you counsel this patient and what is your subsequent management? Justify your answer. **(3)**

## Question 4

A fit 65 year old man presents with a biopsy proven Squamous Cell Carcinoma (SCC) of the left retromolar trigone.

**a.** What specific features would you assess on physical examination and how would you investigate this patient further? Justify your answer. **(2)**

The patient is clinically staged as having a 18mm primary lesion of the retromolar trigone with no nodal involvement (T1N0M0).

**b.** What is your preferred management option for this patient and justify your answer? **(2)**

The patient proceeds to surgery. There are 2 positive level 2 nodes with prominent extracapsular extension in the left neck dissection. The primary is 15 mm with no extension into the tongue, floor of mouth, bone or palate. There is no perineural invasion, margins are clear.

**c.** A decision is made to proceed with adjuvant treatment. Describe a suitable radiation therapy technique and dose fractionation schedule. **(4)**

**d.** What are the indications for adjuvant radiation therapy in an early stage, node negative oral cavity cancer? **(2)**

## Question 5

A 70 year old woman presents with mid thoracic back pain. She was treated for early breast cancer ten years ago. Plain x-rays show sclerosis at T8.

**a.** Describe your initial management for this patient? **(2)**

She has a single 8mm metastasis from breast cancer in the anterior body of T8, with no extension beyond the vertebral body. A decision has been made to treat with Stereotactic Ablative Radiation Treatment (SABR).

**b.** What are the essential features of SABR and the rationale for its use in this setting? **(2)**

**c.** This patient is treated with SABR. Discuss what factors you would consider in simulation, planning and treatment delivery to ensure treatment accuracy and that spinal cord tolerance is not exceeded **(4)**

**d.** Two years later the patient represents with significant pain at the same level. She is found to have an infield recurrence at T8. What factors would you consider in deciding whether re-irradiation is appropriate? **(2)**