

Radiobiology (ONCONU 8002)

M.Sc. Exam 1<sup>st</sup> part

امتحان ماجستير – مقرر البيولوجي والتأثيرات البيولوجية للعلاج الإشعاعي

All questions should be answered:

الزمن : 3 ساعات

الدرجة النهائية (40)

**1- First Question**

**6 Marks**

Discuss with explanation the following clinical condition: A 38-years old man was involved in a nuclear accident. He received a total body radiation dose made up of 22 Gy of alpha-ray, 10 Gy fast neutron and 10 Gy of gamma rays. Discuss the progress of the case and possibility of treatment?

**2- Second Question**

**8 Marks**

Define the phenomenon of accelerated repopulation during radiation therapy and list the clinical strategies to overcome this

**3- Third Question**

**6 Marks**

**Pathogenesis of radiation effects on:-**

- A)- Pregnant women abdomen  
B)- Skin

**4- Fourth Question**

**10 Marks**

Choose the correct answer:

**1. The somatic non-stochastic effect of radiation is seen**

- a. As effects on the body irradiated  
b. As effect of mutation  
c. As hereditary phenomenon  
d. All of the above

**2. X-ray cause radiation damage primarily by their property of**

- a. Penetration  
b. Radioactivity  
c. Electromagnetic induction  
d. Ionisation

**3. Which of the following is an example of a deterministic effect of radiation**

- a. Radiation induced cancer  
b. Mucositis  
c. Genetic and somatic mutation  
d. Tumor induction

**4. The most sensitive phase in cell division to radiation is**

- a. G1 and S2 phase  
b. S1 & S2 phase  
c. M & G2 phase  
d. G1 & G2 phase

**5. Which of the following cell organelle are not affected by radiation induced mechanisms?**

- a. DNA
- b. Cell membrane
- c. Mitochondria
- d. RNA

**6. Sensitivity of a body tissue to radiation is dependent on**

- a. Blood flow
- b. Iron content
- c. Protein content of cells
- d. Mitotic rate of cells

**7. The most radioresistant organ is**

- a. Cartilage
- b. Gonads
- c. Lungs
- d. Lymphoid

**8. The critical organs which are more sensitive to radiation are**

- a. Red bone marrow and gonads
- b. Skin and thyroid
- c. Eye, salivary glands
- d. All of the above

**9. Mitotic delay is longer with**

- a. Smaller dose
- b. Moderate dose
- c. Large dose
- d. Both A & B

**10. Where is the first checkpoint of the cell cycle localized?**

- a. Late G1 prior to S
- b. Late G2 prior to M
- c. Prior to S
- d. Prior to G0

**5- Fifth Question**

**10 Marks**

Mark with True ( T ) or false ( F )

1	Greater metabolic activity increases radiation resistance	
2	Every cell generally has a long period of mitosis.	
3	The retina is sensitive to radiation	
4	There are no fully radioresistant cells.	
5	Water is the most abundant source of free radicals	
6	Ionizing radiation is more effective against cells are that actively dividing, differentiated, and have a long dividing future	
7	Accelerated fractionation reduces the incidence of early effects	
8	After a total body radiation exposure to 100 cGy, an exposed individual will show the manifestation of bone marrow syndrome with 2 hours	
9	Cyclins combine with specific tyrosine kinases called cyclin-dependent kinases, activate them, and regulate their effects.	
10	Skin manifestation are described as “delayed”, and typically appear months to years after radiotherapy.	

**Examination for master degree in oncology**

**Course title: ONCONU 8002.**

**Date: 26/2/2022**

**Term: February 2022**

**Time Allowed: 3 hours**

**Total Assessment Marks: 45**

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Tanta University  
Faculty of Medicine  
Department of: pathology

**Questions Number**

**Marks**

**Q1- What about characteristic features of malignant tumours.**

**10**

**Q2- What you know about GIST.**

**10**

**Q3- Describe clinical presentations of breast carcinomas and their**

**15**

**prognostic tumour markers.**

**Q4- Give an account on lymphomas in infants & young children.**

**10**

**Chairman of Department :**

**Prof Dr. MONA ABDEL HAK.**

Optional Determinant

M.Sc. Exam 1<sup>st</sup> part ONCONU 8004

امتحان ماجستير – مقرر اختياري

All questions should be answered:

الزمن : 3 ساعات

الدرجة النهائية (45 درجة)

Marks

**Q1.**

Enumerate the platinum agent, their therapeutic indication and toxicity associated with each agent and discuss the dose, mechanism of action, and dose adjustment of cisplatin?

20

**Q2.**

**A)** Mention the mechanism of action of fulvestrant, therapeutic indication dose and toxicity.

5

**B)** Discuss in brief the EGFR family and their members used in the treatment of breast cancer.

10

**Q3.** Choose the correct answer

10

**1-Which statement regarding Temozolomide is correct?**

a- It increases the risk of opportunistic infections

b-It is a 5-fluorouracil analogue

c-It is administered as monotherapy as a one week on, one week off scheme

d-It is less active in glioblastoma with methylated MGMT promoter

e-It prolongs QTc-time in ECG

**2-A patient is treated with FOLFOXIRI plus bevacizumab for metastatic BRAF-mutated adenocarcinoma of the colon. After the second course the patient loses all his hair within 4 days.**

**Which drug is most likely the cause?**

- a-5-fluorouracil
- b-Bevacizumab
- c-Ifosfamide
- d-Irinotecan
- e-Oxaliplatin

**3-Which cytostatic drug has a severe interaction with aprepitant?**

- a-Cisplatin
- b-Cyclophosphamide
- c-Docetaxel
- d-Doxorubicin
- e-Irinotecan

**4-A patient with metastatic castration resistant prostate cancer and newly diagnosed bone metastasis starts treatment with abiraterone acetate and denosumab. Eight weeks later he presents with dizziness and muscle cramps. The most likely diagnosis is:**

- a-Hypokalemia due to abiraterone acetate.
- b-Hyperkalemia due to denosumab
- c-Hypercalcemia due to abiraterone acetate
- d-Hypocalcemia due to denosumab
- e-Hypercalcemia due to paraneoplasia.

**5-Associate the tyrosine kinase inhibitor Sorafenib with the correct starting dose**

- a-25 mg daily
- b-400 mg daily
- c-50 mg daily
- d-300 mg twice daily
- e-400 mg twice daily

**6-Which of the following descriptions best fits the definition of febrile neutropenia according to ESMO guidelines on febrile neutropenia?**

- a- Oral temperature  $> 38^{\circ}\text{C}$  for 2 hours and absolute neutrophil count  $< 1.0 \times 10^9/\text{l}$
- b- Oral temperature with two consecutive readings  $> 37.5^{\circ}\text{C}$  and absolute neutrophil count  $< 0.5 \times 10^9/\text{l}$
- c- Oral temperature with two consecutive readings  $> 37.5^{\circ}\text{C}$  and absolute neutrophil count  $< 1.0 \times 10^9/\text{l}$
- d- Oral temperature  $> 38.5^{\circ}\text{C}$  and absolute neutrophil count  $< 1.0 \times 10^9/\text{l}$
- e- Oral temperature  $> 38.5^{\circ}\text{C}$  and absolute neutrophil count  $< 0.5 \times 10^9/\text{l}$

**7-The lowest risk for cardiac toxicity is to be expected with which anthracycline and its cumulative dose?**

- a. Doxorubicin > 500 mg/m<sup>2</sup>.
- b. Epirubicin > 720 mg/m<sup>2</sup>
- c. Idarubicin > 90 mg/m<sup>2</sup>
- d. Liposomal doxorubicin > 600 mg/m<sup>2</sup>
- e. Mitoxantrone > 120 mg/m<sup>2</sup>

**8-A 56-year-old patient is diagnosed with visceral recurrence secondary to a triple negative breast cancer. Biochemical study reveals severe hepatic dysfunction (bilirubin 6 mg/dl (102 mol/l) and SGOT/ASAT 220 units/l). ECOG PS 1. She wishes to be treated. Which is the most suitable treatment option in this case?**

- a. Carboplatin
- b. Doxorubicin
- c. Paclitaxel
- d. Pegylated liposomal doxorubicin.
- e. Vinorelbine

**9-A 75-year-old man receives monochemotherapy with oral capecitabine for colon cancer metastatic to the liver. Twelve days after treatment initiation he develops grade 4 febrile neutropenia and grade 3 diarrhoea and mucositis.**

**Which of the following drug-metabolizing enzymes is most likely to be deficient in this patient?**

- a- CYP2D6
- b- Dihydropyrimidine dehydrogenase (DPD)
- c- O6-methylguanine methyltransferase (MGMT)
- d- Thiopurine S-methyltransferase (TPMT)
- e- Uridine diphosphate glucuronosyl-transferase 1A1 (UGT1A1)

**10-Which of the following drugs blocks the heterodimerization HER-2-HER-3?**

- a. Lapatinib
- b. Olaparib
- c. Pertuzumab
- d. Sunitinib
- e. Trastuzumab

## Radiation Physics

ONCONU 8001 Msc 1<sup>st</sup> part exam

امتحان ماجستير فيزياء اشعاعيه

19/2/2022

الزمن : ٣ ساعات

الدرجة النهائية (100 درجة)

All questions must be answered

1) Write short account about the following

( 20 Marks )

- Factors effect on the Tissue AIR Ratio (TRR) and clinical application in radiotherapy.
- The aim of radiation protection? Discuss the principles of the radiation protection system and types of exposure.

2) Describe in detail interactions and depth ionization curve for electron beam- – explain all parameters needed for prescribed dose and choice the suitable energy for patient treatment. Can use Bolus with electron? Why? (20Marks)

3) Write the relationship between each of the following pairs of physical quantities: (20 Marks)

- Half value thickness and linear attenuation coefficient.
- Radioactivity and time.
- Wavelength and frequency.
- Absorbed dose at a certain depth in a medium and absorbed dose at depth of buildup in the same medium.

4) Briefly explain:

(20 Marks)

- ICRU Reference Point
- Types of Penumbra
- Wedge EFFECT ON BEAM QUALITY
- Tissue equivalent
- Hinge Angle

#### **4-MCQs (20 Marks)**

##### **Choose the Best Answer**

${}^1_5B$ ,  ${}^{12}_6C$ , and  ${}^{12}_7N$  are called

1:

- (a) Isotopes
- (b) Isotones
- (c) Isobars
- (d) Isomers
- (e) Nucleons

2-  $T_{1/2}$  or the half-life of cobalt- 60 is:

- A. 2.6 years
- B. 5.2 years
- C. 8 years
- D. 25 years

3-The SI unit of absorbed dose from ionizing radiation is the:

- A. Becquerel.
- B. MeV
- C. Sievert.
- D. Gray.
- E. Rem.

4-Exposure is defined as:

- A. The total kinetic energy of ions released in a unit mass of air in electronic equilibrium.
- B. Absorbed radiation energy per unit mass of air in electronic equilibrium.
- C. Average electron energy liberated in air.
- D. The total charge of ions of one sign, liberated by photons, per unit mass in air.

5-Elements which have the same Z but different A are called:

- A. Isotopes.
- B. Isomers.
- C. Isotones.
- D. Isobars.
- E. None of the above.

6-Regarding Compton scatter, all correct except:

- A Energy of photon is reduced gradually
- B 90 degree scatter photon has a higher energy than a 60 degree scatter photon
- C Direction of scattered photons depends on energy of incident photon
- D The energy of scattered photon depends on the energy of incident photon.



**7-Which of the following is true regarding bremsstrahlung?**

- A. It is produced when charged particles are decelerated in the field of the nucleus.
- B. Its intensity is proportional to the beam current.
- C. Radiation can be emitted at any angle from the direction of the beam of initial projectiles.
- D. All of the above.
- E. None of the above.

**8-For a beam of mono-energetic photons (such as gamma rays or characteristic X-rays), what is the relationship between the first and the second HVL?**

- A. The first HVL is thicker than the second.
- B. The second HVL is thicker than the first.
- C. Both HVLs are equal.
- D. It depends upon the beam energy.
- E. It depends upon filtration.

**9.Regarding dose, all are true, except:**

- A Absorbed dose is measured is Sieverts
- B Equivalent dose is measured in Sieverts
- C KERMA is measured in Gray
- D  $1\text{Gy} = 1\text{J/kg}$

**10- Photons hit the outer orbital electron, and the photon and electron scatter in different directions at a certain angle. This phenomenon is called:**

- A. Coherent scattering
- B. Photoelectric effect
- C. Compton effect
- D. Pair production
- E. Photodisintegration

**11-All of the following are true regarding percentage depth dose (PDD) except:**

- A. Increases with increasing energy.
- B. Depends on field size.
- C. Is the dose at depth expressed as a percentage of the dose at L.
- D. Decreases with increasing SSD.
- E. Decreases as depth increases.

**12-The factor which most influences the change in PDD with SSD is the change in:**

- A. Beam energy as distance increases.
- B, Scatter in tissue.
- C. Attenuation in the patient.
- D. Inverse square.
- E. Scatter in air.

**13-Linear attenuation coefficient depends on all except-**

- A. Density of the material
- B. Photon energy (kV)
- C. Atomic number (Z)
- D. Physical state of matter

**14. An air kerma of 1mGy will most likely result in a skin dose of (mGy):**

- A 1.5
- B 3
- C 10
- D 12

**13- When a patient is treated with a single megavoltage beam, the surface dose, relative to the maximum dose:**

- A. Increases as the energy increases.
- B. Is on the order of 10% to 40%.
- C. Does not depend on field size.
- D. Decreases when a block tray is placed in the beam.

**14-Which of the following is false? The skin dose, as a percentage of dose at dmax, in a 6 MV photon beam will increase when:**

- A. The SSD is decreased.
- B. The field size is decreased.
- C. Bolus is used.
- D. Fields are treated at oblique incidence.

**15- Regarding TLD (Thermo Luminescent dosimeters) true is:**

- A Used for whole body dosage
- B Cannot be reduced
- C Permanent records achieved
- D Use lithium fluoride as active ingredient

**16-ICRU reports 50 and 62 define as the "variation in size, shape and position of a structure due to breathing, organ motion and organ filling."**

- A. ITV
- B. PTV
- C. PRV
- D. GTV

**17-Which of the following is not correct for the scatter-air ratio (SAR)?**

- A. It is dependent on the SSD
- B. It is dependent on energy
- C. It is dependent on depth
- D. It is used for calculating the mean scattered dose
- E. It is dependent on field size

**18- Which energy is more suitable for treating a lung lesion, 6 MV or 15 MV?**

- A. 15 MV, since the separation is large in the thorax
- B. 6 MV, since the build-up region is much larger for the 15 MV beam
- C. 6 MV, since the total MUs will be lower
- D. 15 MV, because of fewer MU
- E. 15 MV, because of smaller penumbra

**19- Which statement about the PTV is false?**

- A. The PTV is larger than and includes the GTV.
- B. The PTV is larger than and includes the CTV.
- C. The PTV must be obtained from the CTV by enlarging the CTV with uniform margins in all directions.
- D. The PTV should account for setup uncertainties.
- E. A treatment plan can have two unconnected PTVs.

**20-In brachytherapy, advantages of HDR compared to conventional LDR include all of the following, except:**

- A. Reduced need for hospital stay.
- B. Reduced radiation exposure to staff, under normal operating conditions.
- C. Simplifies source inventory and calibration, as only one source is used.
- D. Dose distribution can be optimized.
- E. Reduced risk of normal tissue complications.