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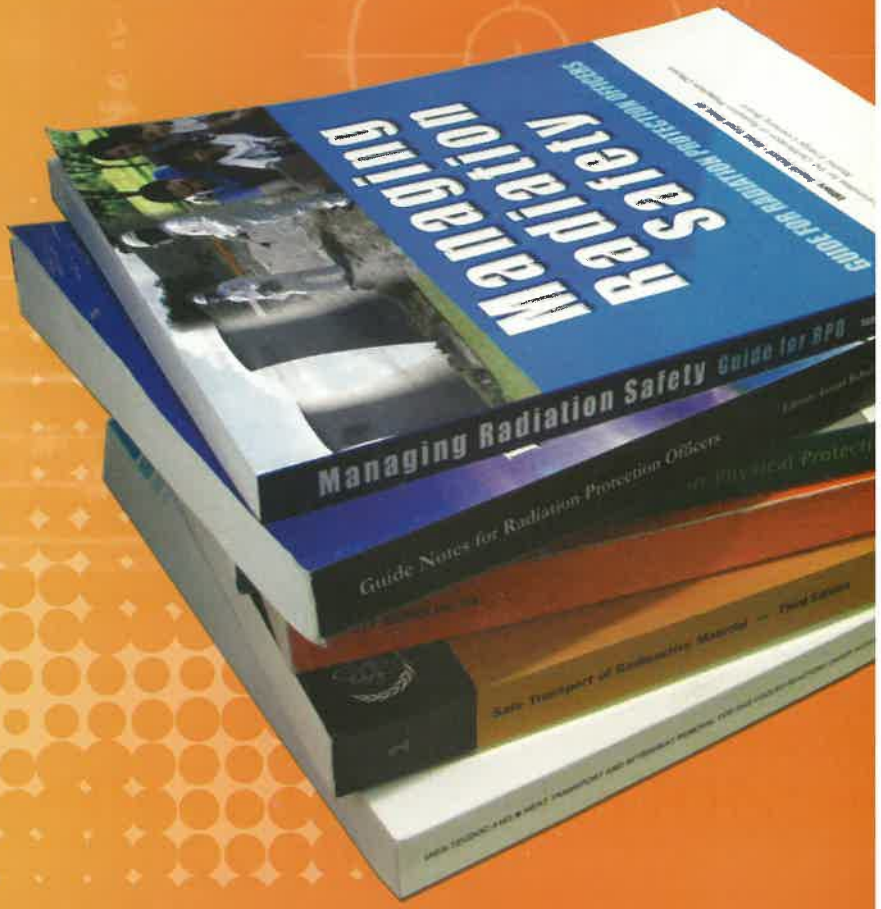
AELB
ATOMIC ENERGY LICENSING BOARD

CERTIFICATION OF RADIATION PROTECTION OFFICER :

EXAMINATION QUESTION SAMPLES



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National Committe for the Certification of Radiation Protection Officers (JKPPPS)
Atomic Energy Licensing Board
Ministry of Science, Technology & Innovation

PREFACE

Under Section 12(1) Atomic Energy Licensing Act 1984 (Act 304), no person shall deal in, possess or dispose of any radioactive material, nuclear material, prescribed substances or irradiating apparatus, unless he is the holder of a valid licence issued under Section 16(5) by the Atomic Energy Licensing Board (AELB). Regulation 23(1) Radiation Protection (Basic Safety Standard) Regulations 1988 requires the licensee to employ a Radiation Protection Officers (RPO) before he can apply for a licence from the AELB.

AELB requires the person who intends to be a RPO to attend RPO training course before one is eligible to seat for the Examination for Certification of RPO conducted by the National Committee for the Certification of RPO (JKPPPS). Person who passes the examination will be recognized by the AELB to be a RPO. Additional training is needed every 3 years to maintain the competency of the RPO. This additional training is to ensure the competency of RPO to manage radiation safety in industries which is a continual improvement process in line with the continual changes in the field of radiation protection.

To ensure relevancy, comprehensiveness, and quality in RPO competency training, the JKPPPS under the AELB has produced this book ***"Certification of Radiation Protection Officer: Examination Question Samples"***. This book was developed by experts and practitioners in various fields of radiation and nuclear technology in industries with at least two main objectives i.e. as a reference material to be used before taking the Examination for Certification of RPO and as a guide for practicing the competency to be a competent RPO. As such this book was prepared to cover a whole range of subjects in radiation safety which is focusing on practical issues related to specific radiation activities, and in accordance with the strict requirements of the approved RPO training syllabus.

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TOPIK 1. MAKLUMAT ASAS SINARAN MENGION
TOPIC 1. FUNDAMENTALS OF IONISING RADIATION

1. Dos terserap diukur dalam unit ...

A. Gray (Gy)
B. rem (rem)
C. Becquerel (Bq)
D. Sievert (Sv)

1. The unit for absorbed dose is ...

A. Gray (Gy)
B. rem (rem)
C. Becquerel (Bq)
D. Sievert (Sv)

2. Di antara berikut yang manakah sinaran mengion?

i. Alfa
ii. Beta
iii. Gama
iv. Neutron
v. Ultra-lembayung

A. i, ii, iii dan iv sahaja
B. i, ii, iii dan v sahaja
C. i, ii dan v sahaja
D. i, ii, iii, iv dan v

2. Which of the followings are ionizing radiations?

i. Alpha
ii. Beta
iii. Gamma
iv. Neutron
v. Ultra-violet

A. i, ii, iii and iv only
B. i, ii, iii and v only
C. i, ii and v only
D. i, ii, iii, iv and v

3. Apakah yang dimaksudkan dengan separuh hayat bagi punca radioaktif?

A. Pengurangan perlahan aktivitinya dalam masa setengah jam.
B. Masa yang diambil bagi punca menjadi setengah daripada beratnya.
C. Masa pengurangan kepada setengah dari kadar dosnya.
D. Satu tempoh masa di mana aktivitinya menjadi setengah daripada aktiviti asal.

3. What is a half-life of radioactive source?

A. Gradual decrease of its activity in half an hour.
B. Time taken for the source to achieve half of its weight.
C. The time taken to decrease to half of its dose rate.
D. The time in which its activity reduces to half of original activity.

4. Susun sinaran mengion berikut mengikut kuasa penembusan (bermula dengan kuasa penembusan yang pendek);

i. Zarah beta
ii. Zarah alfa
iii. Sinaran gama

A. i, ii dan iii
B. ii, i dan iii
C. iii, ii dan i
D. ii, iii dan i

4. Arrange the following ionizing radiation according to their penetrating power (the shortest range first);

i. Beta particle
ii. Alpha particle
iii. Gamma radiation

A. i, ii and iii
B. ii, i and iii
C. iii, ii and i
D. ii, iii and i

5. Penyerapan sinar gama dari punca bila menembusi bahan bergantung kepada ...

A. nombor atom, ketumpatan dan ketebalan bahan.
B. modulus Young bahan.
C. nisbah Poisson bahan.
D. keaktifan spesifik punca.

5. The absorption of gamma-rays from a given source when passing through matter depends on ...

A. the atomic number, density, and thickness of matter.
B. the Young's modulus of matter.
C. the Poisson's ratio of matter.
D. the specific activity of the source.

TOPIK 2. KESAN SINARAN MENGION KE ATAS MANUSIA
TOPIC 2. BIOLOGICAL EFFECTS OF IONISING RADIATION

1. Manakah di antara berikut paling peka terhadap sinaran mengion?

   A. Janin
   B. Kanak-kanak
   C. Remaja
   D. Orang dewasa

1. Which of the following is the most sensitive to ionizing radiation?

   A. Fetus
   B. Child
   C. Adolescent
   D. Adult

2. Kesan stokastik adalah ...

   A. kesan jangka panjang, kebarangkalian kejadian bergantung kepada dos dan tidak mempunyai takat ambang.
   B. kesan jangka panjang, kebarangkalian kejadian bergantung kepada dos dan mempunyai takat ambang.
   C. kesan jangka pendek, kebarangkalian kejadian bergantung kepada dos dan tidak mempunyai takat ambang.
   D. kesan jangka pendek, kebarangkalian kejadian bergantung kepada dos dan mempunyai takat ambang.

2. Stochastic effect is ...

   A. long term effects, probability of occurrence is a function of dose and there is no threshold value.
   B. long term effects, probability of occurrence is a function of dose and there is threshold value.
   C. short term effects, probability of occurrence is a function of dose and there is no threshold value.
   D. short term effects, probability of occurrence is a function of dose and there is threshold value.

3. Tahap kecederaan sinaran individu bergantung kepada perkara berikut, KECUALI ...

   A. kadar dedahan
   B. bahagian badan yang terkena sinaran
   C. jantina/seks individu
   D. umur individu

3. The degree of radiation injury on an individual depends on the followings, EXCEPT ...

   A. the exposure rate
   B. the part of the body irradiated
   C. the gender/sex of the individual
   D. the age of the individual

TOPIK 2. KESAN SINARAN MENGION KE ATAS MANUSIA
TOPIC 2. BIOLOGICAL EFFECTS OF IONISING RADIATION

4. Organ tubuh manusia yang berkait terus dengan kesan genetik apabila terdedah kepada sinaran adalah ...

A. kepala
B. paru-paru
C. tangan
D. gonad

4. *The organ of the human body which is directly related to genetic effect when exposed to radiation is ...*

A. head
B. lungs
C. hands
D. gonads

5. Faktor-faktor yang mempengaruhi kesan somatik adalah ...

i. jumlah dos
ii. kadar dos yang dikenakan
iii. bahagian tubuh yang disinari
iv. umur individu

A. i, iii dan iv sahaja
B. ii, iii dan iv sahaja
C. i, ii, iii dan iv
D. i, ii dan iii sahaja

5. *Factors affecting somatic effects are ...*

i. total dose
ii. rate at which dose is administered
iii. part of the body irradiated
iv. age of individual

A. i, iii and iv only
B. ii, iii and iv only
C. i, ii, iii and iv
D. i, ii and iii only

TOPIK 3. PRINSIP PERLINDUNGAN SINARAN
TOPIC 3. RADIATION PROTECTION PRINCIPLES

1. Kawasan kerja melibatkan sinaran mengion dikelaskan kepada kawasan ...

A. bersih, bahaya dan larangan.
B. selamat, seliaan dan bahaya.
C. bersih, seliaan dan kawalan.
D. kawalan, terhad dan larangan.

1. *Working areas involving ionizing radiation is classified as ..... areas.*

A. clean, danger and prohibited
B. safe, supervised and danger
C. clean, supervised and controlled
D. controlled, restricted and prohibited

2. Penggunaan lapisan plumbum pada dinding, lantai dan siling bagi bilik dedahan ialah untuk ...

A. pengurangan serakan sinaran.
B. memberikan perisaian sinaran.
C. pengecilan alur yang berguna ke aras yang dikehendaki.
D. pengurangan masa dedahan.

2. *The use of lead lining on the walls, floor and ceiling of an exposure room is to ...*

A. reduce scattered radiation.
B. provide radiation shielding.
C. attenuate useful beam to the required level.
D. reduce exposure time.

3. Berapakah kadar dos maksimum yang boleh diterima oleh pekerja sinaran?

i. 1 mSv minggu-1
ii. 50 mSv tahun-1
iii. 25 mSv jam-1
iv. 1000 mSv bulan-1
v. 0.2 mSv hari-1

A. i dan ii sahaja
B. i, ii dan iii sahaja
C. i, ii dan iv sahaja
D. i, ii dan v sahaja

TOPIK 3. PRINSIP PERLINDUNGAN SINARAN
TOPIC 3. RADIATION PROTECTION PRINCIPLES

3. What is the maximum dose rate can be received by a radiation worker?

i. 1 mSv week-1
ii. 50 mSv year-1
iii. 25 mSv hour-1
iv. 1000 mSv month-1
v. 0.2 mSv day-1

A. i and ii only
B. i, ii and iii only
C. i, ii and iv only
D. i, ii and v only

4. TVL (Lapisan Nilai Sepersepuluh) adalah jumlah perisaian untuk ...

A. mengurangkan masa dedahan sebanyak 10%.
B. mengurangkan keamatan sinaran kepada satu persepuluh daripada nilai asalnya.
C. mengurangkan keamatan sinaran sebanyak satu sepersepuluh daripada nilai asal.
D. mengurangkan aktiviti sumber kepada satu persepuluh daripada nilai asalnya.

4. A TVL (Tenth Value Layer) is the amount of shielding to ...

A. reduce the exposure time by 10%.
B. reduce the radiation intensity to one-tenth of its initial value.
C. reduce the radiation intensity by one-tenth of its original value.
D. reduce the source activity to one-tenth of its initial value.

5. Dos sinaran dapat dikurangkan dengan ...

A. memakai lencana dosimeter.
B. bergerak menjauhi punca.
C. memakai dosimeter berpenggera.
D. menggunakan tiub pandu yang lebih pendek.

5. The radiation dose can be reduced by ...

A. wearing a dosimeter badge.
B. moving further away from the source.
C. wearing a dosimeter with an alarm.
D. using a shorter guide tube.

TOPIK 4. PERALATAN DAN KAEDAH PENGUKURAN DAN PEMANTAUAN RADIOLOGI
TOPIC 4. INSTRUMENTATIONS AND METHODS IN RADIOLOGICAL MEASURING AND MONITORING

1. Pusat penaksiran dos sinaran mengion yang diiktiraf oleh Lembaga Perlesenan Tenaga Atom adalah ...

   i. Agensi Nuklear Malaysia
   ii. Jabatan Keselamatan dan Kesihatan Pekerjaan
   iii. Kementerian Kesihatan
   iv. SIRIM Berhad

   A. i sahaja
   B. i dan iii sahaja
   C. iii sahaja
   D. ii dan iv sahaja

1. Dose assessment center(s) for ionizing radiation recognized by Atomic Energy Licensing Board is/are ...

   i. Malaysia Nuclear Agency
   ii. Department of Occupational Safety and Health
   iii. Ministry of Health
   iv. SIRIM Berhad

   A. i only
   B. i and iii only
   C. iii only
   D. ii and iv only

2. Penuras yang berbeza dalam lencana filem bertujuan untuk ...

   A. mengurangkan jumlah dedahan sinaran kepada tubuh.
   B. meningkatkan kepekaan lencana filem.
   C. membolehkan pembezaan sinaran berlainan tenaga.
   D. mengurangkan jumlah sinaran terserak.

2. Different filters in film badge are meant to ...

   A. reduce the amount of radiation exposure to the body.
   B. increase the sensitivity of film badge.
   C. differentiate radiation of different energies.
   D. reduce the amount of scattered radiation.

TOPIK 4. PERALATAN DAN KAEDAH PENGUKURAN DAN PEMANTAUAN RADIOLOGI
TOPIC 4. INSTRUMENTATIONS AND METHODS IN RADIOLOGICAL MEASURING AND MONITORING

3. Dosimeter saku diberikan kepada personel yang memasuki kawasan sinaran untuk ...

   A. memeriksa bacaan lencana filem.
   B. mengurangkan jumlah sinaran.
   C. mengukur dos semasa yang diterima.
   D. menggantikan meter tinjau.

3. A pocket dosimeter is given to personnel entering a radiation area to ...

   A. check the film badge reading.
   B. reduce the amount of radiation.
   C. measure the current dose received.
   D. substitute for survey meter.

4. Pemantauan personel yang memerlukan penaksiran segera dedahan dos, paling baik dilakukan menggunakan ...

   A. lencana filem
   B. dosimeter saku
   C. TLD
   D. meter tinjau

4. Personnel monitoring requiring immediate assessment of the exposure dose, would best be done using ...

   A. film badge
   B. pocket dosimeter
   C. TLD
   D. survey meter

5. Berikut adalah kebaikan lencana filem, KECUALI ...

   A. ia memberikan rekod kekal bagi dedahan yang diterima.
   B. ia sesuai memberikan petunjuk segera dedahan yang diterima ketika kemalangan.
   C. secara relatif ia tidak mahal.
   D. ia memberi maklumat berkaitan dengan kualiti sinaran yang terdedah kepadanya.

5. The followings are the advantages of a film badge, EXCEPT ...

   A. it provides a permanent record of the exposure received.
   B. it is suitable for giving an immediate indication of the exposure received during an accident.
   C. it is relatively inexpensive.
   D. it gives information about the quality of radiation it was exposed to.

TOPIK 5. PENGANGKUTAN BAHAN RADIOAKTIF
TOPIC 5. TRANSPORTATION OF RADIOACTIVE MATERIAL

1. Satu bungkusan bahan radioaktif hendak diangkut dari lapangan terbang ke kawasan penstoran. Jika aras sinaran pada permukaan bekas bungkusan tersebut adalah 1.0 mSv jam-1, apakah jenis label pengangkutan yang mesti digunakan?

   A. Label I-PUTIH
   B. Label II-PUTIH
   C. Label II-KUNING
   D. Label III-KUNING

1. *A package of radioactive material is to be transported from an airport to a storage area. If the radiation level at the surface of the package is 1.0 mSv hr-1, what type of transport label shall be used?*

   A. I-WHITE Label
   B. II-WHITE Label
   C. II-YELLOW Label
   D. III-YELLOW Label

2. Sebarang bungkusan yang indek pengangkutannya (TI) melebihi 10, hendaklah diangkut secara ...

   A. pembungkus terkecuali
   B. pembungkus industri
   C. penggunaan eksklusif
   D. pembungkus Jenis A

2. *Any package whose transport index (TI) is greater than 10, shall be transported under ...*

   A. excepted package
   B. industrial package
   C. exclusive use
   D. type A package

3. Aras sinaran pada mana-mana titik di permukaan luar Pembungkus Terkecuali hendaklah tidak melebihi ...

   A. 5 μSv jam-1
   B. 2 mSv jam-1
   C. 5 mSv jam-1
   D. 10 mSv jam-1

TOPIK 5. PENGANGKUTAN BAHAN RADIOAKTIF
TOPIC 5. TRANSPORTATION OF RADIOACTIVE MATERIAL

3. *The radiation level at any point on the external surface of an Excepted Package shall not exceed ...*

   A. 5 µSv hr-1
   B. 2 mSv hr-1
   C. 5 m Sv hr-1
   D. 10 mSv hr-1

4. Jika disyaki atau ternyata bahawa bungkusan yang mengandungi bahan radioaktif rosak atau bocor, pembawa hendaklah dengan serta-merta ...

   i. memberitahu Lembaga Perlesenan Tenaga Atom.
   ii. menyekat akses kepada bungkusan tersebut.
   iii. menaksir takat kontaminasi yang terhasil dan aras sinaran.
   iv. cuba membaiki bungkusan tersebut.

   A. i dan ii sahaja
   B. ii dan iv sahaja
   C. i, ii dan iii sahaja
   D. i, ii, iii dan iv

4. *If it is suspected or evident that the package containing radioactive material is damaged or leaking, the carrier shall immediately ...*

   i. inform Atomic Energy Licensing Board.
   ii. restrict access to the package.
   iii. make assessment on the extent of resulting contamination and the radiation level.
   iv. try to repair the package.

   A. i and ii only
   B. ii and iv only
   C. i, ii and iii only
   D. i, ii, iii and iv

5. Dalam kes di mana kenderaan jalanraya digunakan sebagai pengangkut bungkusan radioaktif, aras sinaran pada mana-mana tempat duduk yang lazim diduduki hendaklah tidak melebihi ...

   A. 0.01 ?Sv jam-1
   B. 0.02 ?Sv jam-1
   C. 0.01 mSv jam-1
   D. 0.02 mSv jam-1

5. *In the case of a road vehicle being used as a conveyance of radioactive package, the radiation level at any normally occupied position shall not exceed ...*

A. 0.01 ?Sv h-1
B. 0.02 ?Sv h-1
C. 0.01 mSv h-1
D. 0.02 mSv h-1

TOPIK 6. PENGURUSAN SISA RADIOAKTIF
TOPIC 6. RADIOACTIVE WASTE MANAGEMENT

1. Salah satu daripada pernyataan berikut adalah BENAR berkenaan sisa radioaktif.

   A. Semua sisa radioaktif boleh dilupuskan di tapak perlupusan majlis daerah.
   B. Sisa radioaktif tidak berbahaya kepada makhluk hidup.
   C. Sisa radioaktif berbahaya kapada peralatan dan perkakas.
   D. Sisa radioaktif berbahaya kepada semua makhluk hidup.

1. One of the following statements is CORRECT about radioactive wastes.

   A. All radioactive wastes can be disposed at municipal dumping ground.
   B. Radioactive wastes are not hazardous to living organisms.
   C. Radioactive wastes are hazardous to equipment and tools.
   D. Radioactive wastes are harmful to all living organisms.

2. Manakah di antara pernyataan berikut yang berkaitan dengan sisa radioaktif?

   i. Bahan- bahan yang mengeluarkan elektron.
   ii. Semua benda yang telah dicemari oleh bahan radioaktif atau nuklear.
   iii. Bekas tempat menyimpan bahan radioaktif yang kosong.
   iv. Benda yang tercemar dengan proton.

   A. i, ii, iii dan iv
   B. i dan iv sahaja
   C. ii dan iii sahaja
   D. iii sahaja

2. Which of the following statements describe radioactive waste?

   i. Any substance that produces electrons.
   ii. All items that have been contaminated with radioactive or nuclear materials.
   iii. Empty containers for storage of radioactive materials.
   iv. Materials contaminated with protons.

   A. i, ii, iii and iv
   B. i and iv only
   C. ii and iii only
   D. iii only

TOPIK 6. PENGURUSAN SISA RADIOAKTIF
TOPIC 6. RADIOACTIVE WASTE MANAGEMENT

3. Yang manakah di antara pernyataan berikut berkaitan dengan penyimpanan rekod sisa radioaktif?

i. Maklumat berkaitan dengan sisa radioaktif mestilah sentiasa di kunci.
ii. Penyimpanan rekod sisa radioaktif membuktikan pengurusan sisa radioaktif yang berkesan.
iii. Rekod pengawasan saliran dan penilaian kesan radiologikal kepada alam sekitar mestilah disimpan.
iv. Rekod pembungkusan dan pengenalan bagi sisa radioaktif mestilah ditunjukkan bila di minta oleh pihak berkuasa pada bila-bila masa.

A. iv sahaja
B. i dan iv sahaja
C. i, ii, iii dan iv
D. ii, iii dan iv sahaja

3. Which of the following statements are about record keeping for radioactive wastes?

i. Information on radioactive wastes must be kept under lock at all times.
ii. Record keeping is an assurance for radioactive waste management.
iii. Record of effluent monitoring and environmental radiological impact assessment must be kept.
iv. Record of packaging and identification of radioactive waste must be produced on demand when requested by authority.

A. iv only
B. i and iv only
C. i, ii, iii and iv
D. ii, iii and iv only

4. Terdapat ... prinsip asas bagi perlupusan sisa radioaktif.

A. 5
B. 4
C. 3
D. 2

4. There are ... basic principles for disposal of radioactive wastes.

A. 5
B. 4
C. 3
D. 2

TOPIK 6. PENGURUSAN SISA RADIOAKTIF
TOPIC 6. RADIOACTIVE WASTE MANAGEMENT

5. Sisa radioaktif boleh dilupuskan dengan cara berikut :

A. Tapak tanam geologi yang dalam.
B. Dibuang bersama bahan buangan domestik.
C. Disimpan di kawasan setor yang telah dikenalpasti.
D. Dilupuskan di tempat lapang yang jauh dari pandangan orang awam.

5. Radioactive wastes can be disposed by the following means:

A. Deep geological burial.
B. Dispose together with domestic wastes.
C. Keep in an assigned area of a store room.
D. Dispose in an open area away from public view.

TOPIK 7. AKTA DAN PERATURAN BERKAITAN PENGGUNAAN TENAGA ATOM DI MALAYSIA

TOPIC 7. ACTS AND REGULATIONS PERTAINING THE USAGE OF ATOMIC ENERGY IN MALAYSIA

1. Pengawasan perubatan pekerja hendaklah dijalankan oleh ... yang diluluskan oleh AELB.

   A. Pegawai Perlindungan Sinaran
   B. Pegawai Lembaga Perlesenan Tenaga Atom
   C. Pegawai Kesihatan Awam
   D. Pengamal Perubatan Berdaftar

1. Medical surveillance of workers shall be carried out by a ... approved by AELB.

   A. Radiation Protection Officer
   B. Atomic Energy Licensing Board Officer
   C. Public Health Officer
   D. Registered Medical Practitioner

2. Namakan Akta yang memberi kuasa kepada Lembaga Perlesenan Tenaga Atom untuk mengawalselia aktiviti berkaitan dengan tenaga atom di Malaysia.

   A. Akta Benda-benda Radioaktif 1968
   B. Akta Penggunaan Tenaga Atom 1984
   C. Akta Penggunaan dan Perlesenan Tenaga Atom 1985
   D. Akta Perlesenan Tenaga Atom 1984

2. Name the Act that gives authority to the Atomic Energy Licensing Board to control all activities related to atomic energy in Malaysia.

   A. Radioactive Substances Act 1968
   B. Atomic Energy Utilising Act 1984
   C. Atomic Energy Utilising and Licensing Act 1985
   D. Atomic Energy Licensing Act 1984

3. Manakah di antara berikut memberikan penjelasan TERBAIK fungsi Lembaga Perlesenan Tenaga Atom?

   A. Mengeluarkan lesen.
   B. Memberi nasihat pengguna tenaga atom.
   C. Mengawalselia penggunaan tenaga atom
   D. Menambah hasil negara.

3. Which of the following BEST describes the function of the Atomic Energy Licensing Board?

   A. To issue licences.
   B. To advise atomic energy users.
   C. To control and supervise the use of atomic energy
   D. To increase the national revenue.

TOPIK 7. AKTA DAN PERATURAN BERKAITAN PENGGUNAAN TENAGA ATOM DI MALAYSIA

TOPIC 7. ACTS AND REGULATIONS PERTAINING THE USAGE OF ATOMIC ENERGY IN MALAYSIA

4. Makmal Standard Sekunder Dosimetri yang diiktiraf oleh AELB untuk tentukuran peranti pengesanan dan pengukuran sinaran mengion terdapat di ...

A. Agensi Nuklear Malaysia
B. Progam Sains Nuklear, UKM
C. Kementerian Kesihatan Malaysia
D. SIRIM Berhad

4. The Secondary Standard Dosimetry Laboratory recognised by the AELB for calibration of devices for detection and measurement of ionising radiation is located at ...

A. Malaysia Nuclear Agency
B. Nuclear Science Program, UKM
C. Ministry of Health
D. SIRIM Berhad

5. Had Operasi sinaran adalah had yang ditetapkan oleh ...

A. orang bertanggungjawab terhadap lesen
B. Penyelia Perlindungan Sinaran
C. cadangan ICRP
D. AELB

5. The radiation Operational Limit is a limit determined by the ...
A. person responsible for the license
B. Radiation Protection Supervisor
C. ICRP recommendations
D. AELB

TOPIK 8. SISTEM PENGURUSAN KESELAMATAN SINARAN
TOPIC 8. RADIATION SAFETY MANAGEMENT SYSTEM

1. Pengurusan keselamatan sinaran terbaik dilaksanakan sebagai satu sistem kerana sebab-sebab berikut KECUALI ...

   A. Ia memastikan pendekatan sistematik dan sistemik dalam pengurusan keselamatan sinaran.
   B. Ia menggalakkan pengaturan kendiri.
   C. Ia memfokus kepada pematuhan undang-undang sahaja.
   D. Ia memastikan peningkatan berperingkat dalam pencapaian keselamatan sinaran.

1. Radiation safety management is best implemented as a system because of the following reasons EXCEPT ...

   A. It ensures systematic as well as systemic approach in managing radiation safety.
   B. It encourages self-regulation.
   C. It focuses on legal compliance only.
   D. It ensures continual improvement in radiation safety performances.

2. Fungsi Jawatankuasa Keselamatan Sinaran adalah:

   i. mengenalpasti keperluan-keperluan infrastruktur (termasuk kewangan dan latihan) untuk melaksanakan aktiviti keselamatan sinaran secara berkesan.
   ii. memastikan sistem pengurusan keselamatan sinaran diwujud dan dilaksanakan mengikut arahan AELB.
   iii. melaporkan sebarang kemalangan radiologikal kepada AELB.
   iv. memastikan perlaksanaan semua syor-syor yang diluluskan berkaitan dengan keselamatan dan kesihatan sinaran dan kesihatan.

   A. i dan ii sahaja
   B. ii dan iv sahaja
   C. i, ii dan iv sahaja
   D. i, ii, iii dan iv

2. The functions of a Radiation Safety Committee are:

   i. to identify infrastructure requirements (including financing and training) to effectively carry out radiation safety activities.
   ii. to ensure that radiation safety management system is establish and implemented according to the requirement of AELB.
   iii. to notify any radiological accidents to the AELB.
   iv. to ensure that all approved recommendations related to radiation safety and health are implemented.

   A. i and ii only
   B. ii and iv only
   C. i, ii and iv only
   D. i, ii, iii and iv

TOPIK 8. SISTEM PENGURUSAN KESELAMATAN SINARAN
TOPIC 8. RADIATION SAFETY MANAGEMENT SYSTEM

3. Di bawah adalah tanggungjawab Pegawai Perlindungan Sinaran KECUALI ...

A. melantik pekerja untuk diiktiraf oleh AELB sebagai pekerja sinaran.
B. memastikan peranti perlindungan sinaran berfungsi dengan baik.
C. mewujud dan melaksanakan program pengawasan dos porsonel kepada pekerja sinaran.
D. mengkelas kawasan bekerja mengikut Peraturan Perlindungan Sinaran (Standard Keselamatan Asas)

3. Below are responsibilities of a Radiation Protection Officer EXCEPT ...

A. appoint workers to be acredited by the AELB as radiation workers.
B. ensure that radiation protection devices is functioning well.
C. establish and implement personnel dose surveillance programme to radiation workers.
D. clasified working areas according to and Radiation Protection Regulations (Basic Safety Standards).

4. Siapakah bertanggungjawab untuk melaporkan sebarang kemalangan radiasi semasa sedang bekerja ?

A. Pemegang lesen
B. Pegawai Perlindungan Sinaran
C. Penyelia Radiasi
D. Pekerja Sinaran

4. Who is responsible for notifying any radiation accident during work?

A. Licensee
B. Radiation Protection Officer
C. Radiation Supervisor
D. Radiation Workers

5. Pengawasan perubatan pekerja sinaran hendaklah meliputi ...

i. pemeriksaan perubatan pra-pekerjaan
ii. kajian semula kesihatan secara berkala
iii. pemeriksaan perubatan apabila bersara
iv. pengawasan kesihatan am

A. i dan iii sahaja
B. ii dan iv sahaja
C. i, ii dan iii sahaja
D. i, ii, iii dan iv

TOPIK 8. SISTEM PENGURUSAN KESELAMATAN SINARAN
TOPIC 8. RADIATION SAFETY MANAGEMENT SYSTEM

5. Medical surveillance of radiation workers should include ...

i. pre-employment medical check-up
ii. routine medical examination
iii. medical check-up upon retirement
iv. general medical surveillance

A. i and iii only
B. ii and iv only
C. i, ii and iii only
D. i, ii, iii and iv

TOPIK 9. PROSEDUR KESELAMATAN DALAM RADIOGRAFI INDUSTRI
TOPIC 9. SAFETY PROCEDURES IN INDUSTRIAL RADIOGRAPHY

1. Manakah di antara isotop berikut mempunyai separuh hayat yang terpanjang?

   A. Thalium 170
   B. Cobal 60
   C. Iridium 192
   D. Cesium 137

1. Which of the following isotopes has the longest half-life?

   A. Thalium-170
   B. Cobalt-60
   C. Iridium-192
   D. Cesium-137

2. Lapisan nilai separuh bagi keluli untuk Kobalt 60 adalah kira-kira 25 mm. Sekiranya aras sinaran di satu sisi kepingan keluli setebal 75 mm adalah 64 mSv jam^{-1}, aras sinaran selepas merentasi keluli berkenaan adalah ...

   A. 8 mSv jam^{-1}
   B. 16 mSv jam^{-1}
   C. 21 mSv jam^{-1}
   D. 32 mSv jam^{-1}

2. *The half-value layer of steel for cobalt-60 is approximately 25 mm. If the radiation level on the source side of a 75 mm steel plate is 64 mSv hr^{-1}, the radiation level on the opposite side is ...*

   A. 8 mSv hr^{-1}
   B. 16 mSv hr^{-1}
   C. 21 mSv hr^{-1}
   D. 32 mSv hr^{-1}

3. Bila tidak digunakan, punca radioaktif gama untuk radiografi industri sepatutnya ...

i. berada di dalam bekas berperisai dan dikunci dalam kedudukan 'off'.
ii. ditanggalkan dari 'pigtail' nya.
iii. disimpan di kawasan yang jauh dari orang awam.
iv. berada di dalam penukar punca.

A. i sahaja
B. i dan iii sahaja
C. i, ii dan iii sahaja
D. I, ii, iii dan iv

3. When not in use, the gamma radioactive source for industrial radiography should be ...

i. in its shielded container and locked in "off" position.
ii. detached from the pig tail.
iii. stored in an area away from the public.
iv. in source changer.

A. i only
B. i and iii only
C. i, ii and iii only
D. i, ii, iii and iv

4. Sekiranya kadar dos daripada satu punca gama pada jarak 5 meter adalah 10 mSv jam^{-1}, berapakah kadar dosnya pada jarak 0.5 meter?

A. 1 mSv jam^{-1}
B. 50 mSv jam^{-1}
C. 100 mSv jam^{-1}
D. 1000 mSv jam^{-1}

4. If the dose rate from a gamma source is 10 mSv h^{-1} at 5 metres, what will be the dose rate at 0.5 metres?

A. 1 mSv hr^{-1}
B. 50 mSv hr^{-1}
C. 100 mSv hr^{-1}
D. 1000 mSv hr^{-1}

5. Sebelum melakukan sebarang kerja radiografi, jururadiograf mestilah mengambil tindakan berikut KECUALI ...

A. dapatkan kebenaran dari orang yang bertanggungjawab terhadap bilik dedahan.
B. pilih meter tinjau yang sesuai digunakan dan pastikan juga bahawa baterinya berkeadaan baik.
C. pastikan tanda-tanda amaran dengan saiz yang mencukupi dan simbol sinaran yang sesuai disediakan.
D. menyediakan prosedur kecemasan yang akan digunakan sekiranya berlaku kemalangan.

5. Before any radiographic work, the radiographer must take the following actions EXCEPT ...

A. obtain permission of the person responsible for the exposure room.
A. select the appropriate survey meter to be used and ensure that the instrument's battery the warning signs of adequate size and with appropriate radiation symbols.
B. design is in good condition.
C. make available emergency procedure in an event of an accident.

TOPIK 10. RANCANGAN DAN PROSEDUR KECEMASAN DALAM RADIOGRAFI INDUSTRI
TOPIC 10. EMERGENCY PLAN AND PROCEDURES IN INDUSTRIAL RADIOGRAPHY

1. Apabila berlaku kemalangan jalanraya melibatkan kenderaan mengangkut peralatan dedahan yang mengandungi punca radioaktif, hazard yang paling besar adalah ...

   A. pencemaran dalaman.
   B. dedahan sinaran luaran daripada punca yang tidak berperisai.
   C. kebakaran dan sebaran bahan radioaktif.
   D. dedahan sinaran dalaman daripada punca yang tidak berperisai.

1. *After a road accident involving a vehicle transporting exposure device containing radioactive sources, the greatest hazard would be ...*

   A. internal contamination.
   B. external radiation exposure from unshielded sources.
   C. fire and subsequent dispersal of radioactive material.
   D. nternal radiation exposure from unshielded sources.

2. Perkara-perkara berikut ini adalah merupakan amalan kerja yang baik dalam radiografi industri:

   i. Jururadiograf sepatutnya sentiasa berada di luar kawasan kawalan sewaktu dedahan.
   ii. Punca tidak seharusnya dipegang dengan tangan.
   iii. Jururadiograf hendaklah sentiasa berada di kedudukan sejauh mungkin daripada punca sewaktu dedahan.
   iv. Semua kerja dedahan hendaklah dirancang terlebih awal dan dilaksanakan dalam jangkamasa seminimum mungkin.

   A. i sahaja
   B. i and ii sahaja
   C. i, ii and iii sahaja
   D. i, ii, iii and iv

2. *The followings are good work practices for industrial radiography ...*

   i. The radiographer should always be present outside the control area during exposure.
   ii. The source should never be handled with bare hands.
   iii. The radiographer should always position himself as far away as possible from the source during exposure.
   iv. All exposure work should be planned in advance and executed in the minimum possible time.

   A. i only
   B. i and ii only
   C. i, ii and iii only
   D. i, ii, iii and iv

3. Ketika berlaku kemalangan jalanraya melibatkan peralatan radiografi sinar gama dan didapati meter tinjau mengalami kerosakan, pegawai perlindungan sinaran hendaklah dengan serta merta ...

A. Memaklumkan kepada pengurus syarikat dan AELB.
B. Memaklumkan kepada pegawai penguatkuasa awam mengenai kemungkinan dedahan sinaran.
C. Menganggap bahawa punca terdedah sepenuhnya dan menghadkan serta mengawal kawasan.
D. Hubungi syarikat untuk mendapatkan meter tinjau yang baru.

3. In the event of a road accident that involves a gamma exposure device where the survey meter is damaged, the Radiation Protection Officer should immediately ...

A. notify the company's manager and AELB.
B. notify the civil authorities of the possibility of radiation exposure.
C. assume the source is fully exposed, and restrict and control the area.
D. contact the company for a new survey meter.

4. Situasi kecemasan yang melibatkan mesin sinar X boleh berlaku apabila ...

A. mesin dihalakan ke arah lantai.
B. voltan tiub terlalu tinggi.
C. mesin dihidupkan secara tidak sengaja.
D. mesin dihidupkan terlalu lama.

4. An emergency situation involving X-ray machines may occur when ...

A. the machine is directed towards the floor.
B. the tube voltage is excessively high.
C. the machine is unintentionally energised.
D. the machine is turned on for too long.

5. Kehilangan kawalan terhadap punca radioaktif boleh disebabkan oleh perkara berikut KECUALI ...

A. punca tertanggal dari 'pigtail' nya.
B. punca tersekat di dalam tiub pandu.
C. sistem kawalan keselamatan yang tidak berfungsi.
D. pencemaran disebabkan oleh punca yang rosak.

5. *Loss of control of radiography source may be due to the following EXCEPT ...*

A. *source detached from the pig tail.*
B. *source stuck in the guide tube.*
C. *malfunction of the safety control system.*
D. *contamination due to damaged source.*

TOPIK 11. PROSEDUR KESELAMATAN DALAM TOLOKAN NUKLEAR
TOPIC 11. SAFETY PROCEDURES IN NUCLEAR GAUGING

1. Manakah di antara berikut BUKAN merupakan komponen sistem tolokan nuklear?

   A. Pengesan sinaran
   B. Punca sinaran
   C. Pemproses isyarat elektronik
   D. Bekas pengangkut

1. *Which of the followings is NOT a component of a nuclear gauging system?*

   A. A radiation detector
   B. A radiation source
   C. An electronic signal processor
   D. Transport container

2. Manakah di antara sinaran berikut selalu digunakan dalam tolokan nuklear?

   i. Alfa
   ii. Beta
   iii. Gama
   iv. Neutron

   A. i, ii dan iii sahaja
   B. ii, iii dan iv sahaja
   C. ii dan iii sahaja
   D. i, ii, iii dan iv

2. *Which of the following radiations are commonly used in nuclear gauges?*

   i. Alpha
   ii. Beta
   iii. Gamma
   iv. Neutron

   A. i, ii and iii only
   B. ii, iii and iv only
   C. ii and iii only
   D. i, ii, iii and iv

3. Berikut adalah tolok nuklear KECUALI ...

   A. tolok aras
   B. tolok ketumpatan
   C. tolok ketebalan
   D. tolok kekerasan

3. *The followings are nuclear gauges EXCEPT ...*

   A. level gauge
   B. density gauge
   C. thickness gauge
   D. hardness gauge

4. Keupayaan penembusan bagi sinar-X dikawal oleh ... , manakala ketinggian keamatannya dikawal dengan ...

   A. voltan, meningkatkan arus tiub.
   B. miliampiar, menurunkan arus tiub.
   C. masa, menjauhkan spesimen dari filem.
   D. dedahan, merendahkan voltan kepada tiub.

4. *Penetrating ability of an X-ray is controlled by ... , whereas the intensity is increased by ...*

   A. voltage, increasing the current tube.
   B. milliampere, decreasing the current tube.
   C. time, moving away the specimen from the film.
   D. exposure, decreasing voltage to the tube.

5. Kawasan kecil dalam tiub sinar-X yang mengeluarkan sinaran dipanggil ...

   A. anod
   B. titik fokus
   C. mangkuk penumpu
   D. katod

5. *The small area in the X-ray tube from which radiation emitted is called the ...*

   A. anode
   B. focal spot
   C. focusing cup
   D. cathode

TOPIK 12. RANCANGAN DAN PROSEDUR KECEMASAN DALAM TOLOKAN
TOPIC 12. EMERGENCY PLAN AND PROCEDURES IN NUCLEAR GAUGING

1. Kesediaan kecemasan untuk tolok nuklear terdiri daripada perkara berikut KECUALI ...

   A. rancangan kecemasan yang kerap diuji.
   B. menyemak semula dan mengemaskini secara berterusan rancangan kecemasan dan prosedurnya.
   C. pemeriksaan yang kerap terhadap kelengkapan kecemasan.
   D. ujian kebocoran yang kerap terhadap punca sinaran.

1. Emergency preparedness for nuclear gauges consists of the following items EXCEPT ...

   A. regular testing of the emergency plan.
   B. continuous revision and updating of the emergency plan and its procedures.
   C. regular check of emergency equipment.
   D. regular leak test of the radiation sources.

2. Apabila kerosakan yang berkaitan dengan kebocoran punca sinaran tolokan berlaku, kejadian ini dikelaskan sebagai ...

   A. Tahap 1
   B. Tahap 2
   C. Tahap 3
   D. Tahap 4

2. When failure is due to the leakage of the radiation source of the nuclear gauges, the emergency involved is classified as ...

   A. Level 1
   B. Level 2
   C. Level 3
   D. Level 4

3. Apabila kegagalan yang berkaitan dengan kehilangan punca sinaran tolokan berlaku, kejadian ini dikelaskan sebagai ...

   A. Tahap 1
   B. Tahap 2
   C. Tahap 3
   D. Tahap 4

3. *When failure is due to the loss of radiation source of the nuclear gauges, the emergency involved is classified as ...*

   A. Level 1
   B. Level 2
   C. Level 3
   D. Level 4

4. Tanggungjawab seorang ... adalah untuk memastikan keselamatan alatan serta bertanggungjawab kepada dedahan lebihan apabila dos bulanan yang diterima oleh personal lebih tinggi daripada operasi ataupun had dos tahunan.

   A. Pekerja Sinaran
   B. Pengawas Kecemasan
   C. Penyelia Pekerja
   D. Pegawai Perlindungan Sinaran

4. *It is the responsibility of the ... to make safe the device responsible for the overexposure when the monthly dose received by the personnel is higher than the operational or annual dose limit.*

   A. Radiation Worker
   B. Emergency Coordinator
   C. Work Supervisor
   D. Radiation Protection Officer

5. Aktiviti berikut perlu dilakukan sebelum siasatan kemalangan yang berkaitan tolokan KECUALI ...

   A. Mengenalpasti dan melatih penyiasat.
   B. Mengumpulkan alat untuk penyiasatan.
   C. Mempunyai polisi yang mengkehendaki semua kemalangan dilaporkan.
   D. Menentukan punca kemalangan.

5. *The followings are activities that need to done before accident investigation involving nuclear gauges is carried out EXCEPT ...*

   A. Identify and training the investigator.
   B. Assembly of tools for investigation.
   C. Having a policy requiring all accidents to be reported.
   D. Determine the root causes of the accidents.

TOPIK 13. PROSEDUR KESELAMATAN DALAM PENYELIDIKAN MENGGUNAKAN SINARAN

TOPIC 13. SAFETY PROCEDURES IN RESEARCH USING RADIATION

1. Jenis punca sinaran yang digunakan dalam penyelidikan termasuk ...

   i. radas penyinaran
   ii. punca terkedap
   iii. punca tak terkedap
   iv. punca radioaktif 'well logging'

   A. i dan ii sahaja
   B. i, ii dan iii sahaja
   C. ii, iii dan iv sahaja
   D. i, ii, iii dan iv

1. Types of radiation sources use in research include ...

   i. Irradiating apparatus
   ii. Sealed sources
   iii. Unsealed sources
   iv. Well logging radioactive sources

   A. i and ii only
   B. i, ii and iii only
   C. ii, iii and iv only
   D. i, ii, iii and iv

2. Radionuklid yang diguna dalam penyelidikan yang masa separuhnya dalam julat bulanan dan tahunan dianggap sebagai ...

   A. radioisotop masa separuh hayat pendek
   B. radioisotop masa separuh hayat sederhana
   C. radioisotop masa separuh hayat lama
   D. radioisotop masa separuh hayat sangat lama

2. The radionuclides used in research which have half-lives in the range of months and years are considered as ...

   A. short half-lives radioisotopes.
   B. medium half-lives radioisotopes.
   C. long half-lives radioisotopes.
   D. very long half-lives radioisotopes.

3. Radionuklid Cs-137 yang mempunyai masa separuh hayat 30.72 tahun dikategorikan sebagai ...

A. radioisotop masa separuh hayat pendek
B. radioisotop masa separuh hayat sederhana
C. radioisotop masa separuh hayat lama
D. radioisotop masa separuh hayat sangat lama

3. The Cs-137 radionuclide which has half-live of 30.72 years is categorised as ...

A. short half-lives radioisotopes.
B. medium half-lives radioisotopes.
C. long half-lives radioisotopes.
D. very long half-lives radioisotopes.

4. Hazard sinaran berikut berkait aktiviti penyelidikan menggunakan radas penyinaran adalah.....

i. pencemaran
ii. dedahan sinaran dalaman
iii. dedahan sinaran luaran

A. i dan ii sahaja
B. ii dan iii sahaja
C. i, ii dan iii sahaja
D. iii sahaja

4. The radiation hazard(s) associated with research activities using irradiating apparatus is (are) ...

i. contamination
ii. internal radiation exposure
iii. external radiation exposure

A. i and ii only
B. ii and iii only
C. i, ii and iii only
D. iii only

TOPIK 13. PROSEDUR KESELAMATAN DALAM PENYELIDIKAN MENGGUNAKAN SINARAN

TOPIC 13. SAFETY PROCEDURES IN RESEARCH USING RADIATION

5. Salah satu unsur penting dalam program perlindungan sinaran ialah perancangan kemudahan. Ianya membabitkan kawalan kejuruteraan berikut bagi hazard sinaran KECUALI ...

i. rekabentuk makmal
ii. kawasan kerja yang dapat mengendali punca sinaran dan radioaktif dengan selamat ketika bekerja
iii. kit kecemasan
iv. penyimpanan dan pelupusan

A. i dan ii sahaja
B. i, ii dan iii sahaja
C. ii, iii dan iv sahaja
D. i, ii, iii dan iv

5. *Facility planning is one important element in a radiation protection programme. It involves the following engineering controls of the radiation hazard, EXCEPT ...*

i. design of laboratory
ii. work areas to safely handle radiation and radioactive sources during work
iii. emergency kit
iv. storage and disposal

A. i and ii only
B. i, ii and iii only
C. i, ii and iv only
D. i, ii, iii and iv

TOPIK 14. RANCANGAN DAN PROSEDUR KECEMASAN DALAM PENYELIDIKAN DAN PENGAJARAN MENGGUNAKAN SINARAN

TOPIC 14. EMERGENCY PLAN AND PROCEDURES IN RESEARCH AND TEACHING USING RADIATION

1. Kemasukan tanpa izin ke kawasan kawalan dan seliaan sinaran adalah contoh kecemasan yang disebabkan oleh ...

   A. hilang kawalan personel
   B. hilang kawalan radas penyinaran
   C. hilang kawalan punca terkedap
   D. hilang kawalan punca tak terkedap

1. Unauthorised entry to radiation control and supervised area is an example of emergency due to ...

   A. loss of control of personnel
   B. loss of control of irradiating apparatus
   C. loss of control of sealed source
   D. loss of control of unsealed source

2. Berikut adalah contoh kecemasan yang disebabkan oleh hilang kawalan punca terkedap, KECUALI ...

   A. kegagalan untuk menutup penutup.
   B. kecurian atau salah letak punca.
   C. operasi peranti sinaran tanpa izin.
   D. tumpahan dan kontaminasi punca radioaktif.

2. The followings are examples of emergency due to loss of control of sealed source, EXCEPT ...

   A. failure of shutter to close.
   B. stolen or misplaced of source.
   C. unauthorised operation of radiation devices.
   D. spillage and contamination of radioactive sources.

3. Manakah di antara pernyataan berikut adalah SALAH?

   A. Pemegang lesen bertanggungjawab untuk memberitahu AELB bagi setiap kemalangan melibatkan sinaran di tempat kerja.
   B. Penyiasatan kemalangan sinaran dikehendaki oleh undang-undang.
   C. Organisasi tidak diperlukan untuk mempunyai satu polisi bagi menyiasat dan melaporkan kemalangan sinaran.
   D. Laporan bertulis lengkap penyiasatan kemalangan sinaran mesti dikemukakan kepada pihak berkuasa berkenaan dalam masa 30 hari.

TOPIK 14. RANCANGAN DAN PROSEDUR KECEMASAN DALAM PENYELIDIKAN DAN PENGAJARAN MENGGUNAKAN SINARAN

TOPIC 14. EMERGENCY PLAN AND PROCEDURES IN RESEARCH AND TEACHING USING RADIATION

3. *Which of the following statements is FALSE?*

   A. *Licensee is responsible for notifying the AELB of any radiation accident at the place of work.*
   B. *Radiation accident investigation is required by law.*
   C. *It is not necessary for an organisation to have a policy to investigate and report a radiation accident.*
   D. *Full written radiation accident investigation report must be submitted to the appropriate authority within 30 days.*

4. Program latihan Kesiapsiagaan Kecemasan sinaran merangkumi yang berikut KECUALI ...

   A. prinsip umum perlindungan sinaran.
   B. prosedur kecemasan berkaitan.
   C. peralatan dan kelengkapan sinaran yang berkaitan.
   D. cara untuk mengenalpasti ciri fizikal bahan yang akan didedah kepada sinaran.

4. *The training of Radiation Emergency Preparedness include the followings EXCEPT ...*

   A. *general radiation protection principles.*
   B. *relevant emergency procedures.*
   C. *radiation related instruments and equipment.*
   D. *methods for determining the physical properties of materials to be radiated.*

5. Manakah di antara pernyataan berikut menerangkan kecemasan radiologi Aras 2 berdasarkan kepada keluasan geografi?

   A. Had kepada satu bilik/makmal/bangunan.
   B. Had kepada perimeter kemudahan.
   C. Berkemungkinan mempunyai dedahan sinaran yang signifikan di bahagian luar perimeter luar kemudahan yang terlibat.
   D. Berkemungkinan mempunyai kesan melintasi sempadan seperti yang dimaksudkan di dalam Konvensyen Kemalangan Nuklear.

5. *Which of the following statements describes Level 2 radiological emergency based on geographical extent of the consequence?*

   A. *Limited to a single room/laboratory/building.*
   B. *Limited to the perimeter of the facility.*
   C. *Might have significance radiation exposure outside the outer perimeter of the facility involved.*
   D. *Might have trans-boundary effect as defined in the Convention of a Nuclear Accident*