Enclosure 1

Examination Report No. 50-89/OL-89-02

Facility: General Atomics

Examinations administered at the General Atomics, Torrey Pines Facility, San Diego, California.

Chief Examiner: Lewis J Mulley for 11-17-89
Thomas L. Meadows, Date Signed
Operator Licensing Examiner

Approved: Lewis J Mulley 11-17-89
Lew Miller, Chief Date Signed
Operations Section

Summary:

Examinations from October 31 through November 2, 1989, (Report No. 50-89/OL-89-02)

Operator licensing examinations were administered to one Reactor Operator (RO) and two Senior Reactor Operator (SRO) candidates. All of these candidates passed their examinations and were subsequently issued licenses.

REPORT DETAILS

1. Examiners

   Thomas R. Meadows, RV, Chief Examiner

2. Persons Attending the Exit Meeting on November 3, 1989

   Thomas Meadows, RV, Chief Examiner
   Robert Chesworth, Managing Director, TRIGA Group
   Keith Asmussen, Manager, Licensing, Safety and Nuclear Compliance
   *William Wittemore, Director, Irradiation Services
   *Junaid Razvi, Manager, TRIGA Reactors Facility

   *Attended the written examination review on November 2, 1989

3. Written Examinations and Facility Review

   The written examinations were administered on October 31, 1989 at the General Atomics, Torrey Pines Reactor Facility. At the conclusion of these examinations the Chief Examiner held a formal review with the facility staff identified in paragraph (2) above, in accordance with NUREG 1021, The Operator Licensing Examiner Standards. All facility comments were resolved during this review. The NRC resolution of these comments are documented in Enclosure (3) of this report, which includes the licensee's formal record of this meeting [Attachment A to Enclosure (3)].

   All of the candidates passed this portion of their examination.

4. Operating Examinations

   The operating examinations were administered on November 1-2, 1989. These examinations were conducted using walk-through scenarios that tested the operator candidates integral system knowledge and ability to actually operate the reactor facilities. Aspects of facility design and control, administration, security, and emergency plan were also thoroughly tested.

   All of the operator candidates passed the operating portion of their examinations.

   The examiner found that the candidates had difficulty referencing the standard operating procedures (SOP-IV), or abnormal/emergency operating procedures (SOP VI/ VII) that stipulate the safe operation of facility. Although the candidates performed the correct actions required by the examination scenarios imposed, they had difficulty referencing the associated procedures when asked to substantiate their actions.

   The facility management identified in paragraph (1) committed to the immediate correction of this generic training program weakness. They concurred that operators must be familiar with the structure of the procedures that govern their actions.

5. Exit Meeting

On November 3, 1989, the Chief Examiner met with the representatives of the licensee's staff to discuss the examination.

Enclosure 3

WRITTEN EXAMINATION FACILITY COMMENTS/NRC RESOLUTION OF COMMENTS (SRO/RO EXAMINATIONS)

Note

The Chief Examiner met with the facility staff for a formal review of both the RO and SRO written examinations on 11/2/89. As a result of this review, the following questions were deleted with the concurrence of the Chief Examiner and the Facility staff. There were no other comments.

Question H.08 (SRO Exam):

Comment:

"Statement of the question was erroneous, which led to none of the answers as being correct."

NRC Resolution:

The facility staff pointed out that the stated initial power reading of 1,000 CPS could imply that the reactor went super-critical in the source range. If, this "assumption" was made none of the responses would be correct since a linear power rise would be observed in the source range. Therefore, Chief Examiner concurred that question be deleted.

Questions A.11 (RO Exam)/H.17 (SRO Exam):

Comment:

"None of the answers given were the correct - verified in references."

NRC Resolution:

The Chief Examiner concurred that a mistake had been made when transcribing data from the reference material. Therefore, these questions were deleted from the applicable examinations.

Questions B.14 (RO Exam)/K.05 (SRO Exam):

Comment:

"More than one correct answer to the question as it was worded."

NRC Resolution:

Although the MARK-F reactor facility was designed with pulsing capability, the transient rod was physically removed from the core to facilitate a recent research project. The Chief Examiner discovered this during his on-site pre-tour/inspection of the facility. Since the condition setting of the question is no longer accurate, it was deleted from the applicable examinations.

Question C.02 (RO Exam)/H.23 (SRO Exam):

Comment:

"None of the answers given were correct - verified in references."

NRC Resolution:

Although the references address the characteristics of the BATH coefficient, they address only its behavior for "standard" TRIGA fuel. Since the MARK-F reactor uses "FLIP" fuel the question is erroneous. BATH behavior in FLIP fuel has not been analyzed. This fact was not clear in the references. Therefore, the question was deleted from it's applicable examinations.

Questions C.08 (RO Exam)/J.08 (SRO Exam):

Comment:

"Question does not apply to facility; question deleted by examiner and agreed to by facility reviewers."

NRC Resolution:

Same resolution as "Questions B.14/K.05." The question was deleted from its applicable examinations.

Questions D.05 (RO Exam)/J.12 (SRO Exam):

Comment:

"None of the answers were strictly correct, and question was worded such that one of two choices could have been interpreted as the correct answer."

NRC Resolution:

The regulating rod drive motor for the MARK-1 reactor facility was changed to a D.C. drive mechanism and separate rod position monitor. This fact was validated on-site by the Chief Examiner and the affected questions were subsequently deleted from the applicable examinations.

Questions G.08 (RO Exam)/I.08 (SRO Exam):

Comment:

"More than one answer was correct for the question as worded - verified in references."

NRC Resolution:

The MARK-F evacuation alarm initiation system is not clearly defined in the reference material. The Chief Examiner verified the actual alarm system during his on-site inspection, and agrees that the affected questions could have more than one correct response. Therefore, these questions were deleted from their applicable examinations.

Question I.20 (SRO Exam):

Comment:

"None of the answers were correct - verified in references."

NRC Resolution:

The G.A. reference supplied by the facility at the review meeting supported a different quality factor from the initial reference used for the question. Since this discrepancy made all of the responses incorrect, the question was deleted from the exam.

Question I.21 (SRO Exam):

"Wording of the question was such that any one of three answers could have been interpreted as being correct."

NRC Resolution:

The wording of the question stem left various analysis paths open such that more than one of the responses could be interpreted as correct. Therefore, this question was deleted from the examination.

Enclosure 3 (Attachment A)

GENERAL ATOMICS

TRIGA Reactors Facility
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Phone: (619) 455-3277

November 8, 1989

Mr. John B. Martin
Regional Administrator
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596

Subject: RO and SRO examinations administered at General Atomics, October 30 - November 2, 1989.

Reference: Letter, K. E. Asmussen (GA) to J. B. Martin (U.S. NRC Region V), No. RO/SRO-1474, dated November 3, 1989.

Dear Mr. Martin:

In the reference letter, General Atomics (GA) had confirmed that the Chief NRC Examiner for the subject examinations, Mr. Tom Meadows, and the GA facility staff consisting of the undersigned and Dr. W. L. Whittemore, reviewed and finalized the examination keys and that there were no additional comments from GA on these examinations.

In this review, the chief examiner and the facility staff discussed each question, and agreed to delete a number of questions. The reasons for the deletions were one or more of the following: (a) the question was not consistent with the training material as submitted, (b) the question was not applicable to the GA facility, or (c) the wording of the question was such that more than one correct answer was possible.

As a result of the review, six questions from the RO exam, and nine questions from the SRO exam were deleted. Attachment A is a list of these questions, along with a brief statement as to the reason why the facility staff and the chief examiner agreed to the deletion.

If you should have further questions regarding this matter, please contact me or Dr. W. L. Whittemore at (619)455-3277.

Very truly yours,

Junaid Razvi

Junaid Razvi, Ph.D.
Manager, TRIGA Reactors Facility

JR

cc: Mr. Tom Meadows, NRC Region V
Dr. K. E. Asmussen
Dr. W. L. Whittemore

ATTACHMENT A

Question No. (RO)	Question No. (SRO)	Reason
-	H.08	Statement of the question was erroneous, which led to none of the answers as being correct.
A.11	H.17	None of the answers given were the correct - verified in references.
B.14	K.05	More than one correct answer to the question as it was worded.
C.02	H.23	None of the answers given were correct - verified in references.
C.08	J.08	Question does not apply to facility; question deleted by examiner and agreed to by facility reviewers.
D.05	J.12	None of the answers were strictly correct, and question was worded such that one of two choices could have been interpreted as the correct answer.
G.08	I.08	More than one answer was correct for the question as worded - verified in references.
-	I.20	None of the answers were correct - verified in references.
-	I.21	Wording of the question was such that any one of three answers could have been interpreted as being correct.

MASTER

KEY

U.S. NUCLEAR REGULATORY COMMISSION
SENIOR REACTOR OPERATOR LICENSE EXAMINATION

Facility: Gulf Atomic
Reactor Type: TRIGA [MARK 1 & MARK F]
Date Administered: October 31, 1989
Examiner: Thomas R. Meadows
Candidate: ~~***~~ ***KEY***

INSTRUCTIONS TO CANDIDATE

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category. Examination papers will be picked up six (6) hours after the examination starts.

Category Value	% of Total	Applicant's Score	% of Cat. Value	Category
~~24~~ 21	~~21.4%~~ 20.2			H. Reactor Theory
~~23~~ 20	~~20.5%~~ 19.2			I. Radioactive Materials Handling Disposal and Hazards
~~24~~ 22	~~21.4%~~ 21.2			J. Specific Operating Characteristics
21	~~18.8%~~ 20.2			K. Fuel Handling and Core Parameters
20	~~17.9%~~ 19.2			L. Administrative Procedures, Conditions and Limitations
~~112~~ 104	100%			Totals

Final Grade _____%

All work done on this examination is my own. I have neither given nor received aid.

KEY
Candidate's Signature

ES-201
Rev. 5 01/01/89

PROCEDURES FOR THE ADMINISTRATION OF WRITTEN EXAMINATIONS

During the administration of this examination the following rules apply:

1. Cheating on the examination means an automatic denial of your application and could result in more severe penalties.

2. After the examination has been completed, you must sign the statement on the cover sheet indicating that the work is your own and you have not received or given assistance in completing the examination. This must be done after you complete the examination.

3. Restroom trips are to be limited and only one applicant at a time may leave. You must avoid all contacts with anyone outside the examination room to avoid even the appearance or possibility of cheating.

4. Use black ink or dark pencil only to facilitate legible reproductions.

5. Print your name in the blank provided in the upper right-hand corner of the examination cover sheet.

6. Fill in the date on the cover sheet of the examination (if necessary).

7. You may write your answers on the examination question page or on a separate sheet of paper. USE ONLY THE PAPER PROVIDED AND DO NOT WRITE ON THE BACK SIDE OF THE PAGE.

8. If you write your answers on the examination question page and you need more space to answer a specific question, use a separate sheet of the paper provided and insert it directly after the specific question. DO NOT WRITE ON THE BACK SIDE OF THE EXAMINATION QUESTION PAGE.

9. Print your name in the upper right hand corner of the first page of each section of your answer sheets whether you use the examination question pages or separate sheets of paper. Initial each page.

10. Before you turn in your examination, consecutively number each answer sheet, including any additional pages inserted when writing your answers on the examination question page.

11. If you are using separate sheets, number each answer as to category and number (i.e. 1.04, 6.10) and skip at least 3 lines between answers to allow space for grading.

12. Write "End of Category " at the end of your answers to a category.

13. Start each category on a new page.

14. Write "Last Page" on the last answer sheet.

15. Use abbreviations only if they are commonly used in facility literature. Avoid using symbols such as < or > signs to avoid a simple transposition error resulting in an incorrect answer. Write it out.

16. The point value for each question is indicated in parentheses after the question. The amount of blank space on an examination question page is NOT an indication of the depth of answer required.

17. Show all calculations, methods, or assumptions used to obtain an answer.

18. Partial credit may be given. Therefore, ANSWER ALL PARTS OF THE QUESTION AND DO NOT LEAVE ANY ANSWER BLANK. Partial credit will not be given on multiple choice questions.

19. Proportional grading will be applied. Any additional wrong information that is provided may count against you. For example, if a question is worth one point and asks for four responses, each of which is worth 0.25 points, and you give five responses, each of your responses will be worth 0.20 points. If one of your five responses is incorrect, 0.20 will be deducted and your total credit for that question will be 0.80 instead of 1.00 even though you got the four correct answers.

20. If the intent of a question is unclear, ask questions of the examiner only.

21. When turning in your examination, assemble the completed examination with examination questions, examination aids and answer sheets. In addition, turn in all scrap paper.

22. To pass the examination, you must achieve an overall grade of 80% or greater and at least 70% in each category.

23. There is a time limit of (6) hours for completion of the examination (or some other time if less than the full examination is taken).

24. When you are done and have turned in your examination, leave the examination area (DEFINE THE AREA). If you are found in this area while the examination is still in progress, your license may be denied or revoked.

25. Ensure that all information you wish to have evaluated as part of your answer is on your answer sheet, scrap paper will be disposed of without review immediately following the examination.

EQUATION SHEET

$f = ma$

$w = mg$

$E = mC^2$

$KE = \frac{1}{2}mv^2$

$PE = mgh$

$W = v\Delta P$

$\Delta E = 931\Delta m$

$\dot{Q} = \dot{m}C_p\Delta T$

$\dot{Q} = UA\Delta T$

$Pwr = W_f \dot{m}$

$P = P_o\ 10^{SUR(t)}$

$P = P_o\ e^{t/T}$

$SUR = 26.06/T$

$T = 1.44\ DT$

$SUR = 26\left(\frac{\lambda_{eff}\rho}{\bar{\beta} - \rho}\right)$

$T = (\ell^*/\rho) + [(\bar{\beta} - \rho)/\lambda_{eff}\rho]$

$T = \ell^*/(\rho - \bar{\beta})$

$T = (\bar{\beta} - \rho)/\lambda_{eff}\rho$

$\rho = (K_{eff} - 1)/K_{eff} = \Delta K_{eff}/K_{eff}$

$\rho = [\ell^*/TK_{eff}] + [\bar{\beta}/(1 + \lambda_{eff}T)]$

$P = I\phi V/(3 \times 10^{10})$

$I = N\sigma$

$v = s/t$

$s = v_o t + \frac{1}{2}at^2$

$a = (v_f - v_o)/t$

$v_f = v_o + at$

$\omega = \theta/t$

Cycle efficiency = $\frac{\text{Net Work (out)}}{\text{Energy (in)}}$

$A = \lambda N \qquad A = A_o e^{-\lambda t}$

$\lambda = \ln 2/t_{\frac{1}{2}} = 0.693/t_{\frac{1}{2}}$

$t_{\frac{1}{2}}(eff) = \frac{(t_{\frac{1}{2}})(t_b)}{(t_{\frac{1}{2}} + t_b)}$

$I = I_o e^{-Ix}$

$I = I_o e^{-\mu x}$

$I = I_o\ 10^{-x/TVL}$

$TVL = 1.3/\mu$

$HVL = 0.693/\mu$

$SCR = S/(1 - K_{eff})$

$CR_x = S/(1 - K_{effx})$,

$CR_1(1 - K_{eff})_1 = CR_2(1 - K_{eff})_2$

$M = 1/(1 - K_{eff}) = CR_1/CR_0$

$M = (1 - K_{eff})_0/(1 - K_{eff})_1$

$SDM = (1 - K_{eff})/K_{eff}$

$\ell^* = 1 \times 10^{-5}$ seconds

$\lambda_{eff} = 0.1\ \text{seconds}^{-1}$

$I_1 d_1 = I_2 d_2$

$I_1 d_1^2 = I_2 d_2^2$

$R/hr = (0.5\ CE)/d^2$ (meters)

$R/hr = 6hCE/d^2$ (feet)

WATER PARAMETERS

1 gal. = 8.345 lbm

1 gal. = 3.78 liters

1 ft^3 = 7.48 gal.

Density = 62.4 lbm/ft^3

Density = 1 gm/cm^3

Heat of vaporization = 970 Btu/lbm

Heat of fusion = 144 Btu/lbm

1 Atm = 14.7 psi = 29.9 in. Hg

1 ft. H_2O = 0.4335 lbf/in^2

MISCELLANEOUS CONVERSIONS

1 Curie = 3.7×10^{10} dps

1 kg = 2.21 lbm

1 hp = 2.54×10^3 BTU/hr

1 Mw = 3.41×10^6 Btu/hr

1 Btu = 778 ft-lbf

1 inch = 2.54 cm

$^oF = 9/5\,^oC + 32$

$^oC = 5/9\,(^oF - 32)$

CATEGORY H
REACTOR THEORY

*QUESTION H.01 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

Which one of the following correctly describes a GOOD REFLECTOR?

a. A good reflector has a LOW albedo AND is LESS THICK than the average distance over which a thermal neutron diffuses.

b. A good reflector has a LOW albedo AND is THICKER than twice the average distance over which a thermal neutron diffuses.

c. A good reflector has a HIGH albedo and is LESS THICK than the average distance over which a thermal neutron diffuses.

d. A good reflector has a HIGH albedo and is THICKER than twice the average distance over which a thermal neutron diffuses.

*ANSWER

d.

*REFERENCE (H.01)

GA Reactor Operator Training Manual, 6-7

*QUESTION H.02 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

Which one of the following statements correctly states how NEUTRON FLUX is affected by the addition of a reflector around a reactor core?

a. With a reflector in place thermal flux is higher at the edge of the core.

b. With a reflector in place thermal flux is lower at the edge of the core.

c. With a reflector in place fast flux is higher at the edge of the core.

d. With a reflector in place fast flux is lower at the edge of the core.

*ANSWER

a.

*REFERENCE $ (H.02)

GA Reactor Operator Training Manual, 6-7

*QUESTION H.03 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

The fraction of delayed neutrons are denoted by the terms B [beta] and Beff [beta effective].

Which of the following statements correctly describes how B differs from Beff?

a. B is larger than Beff since the average energy of delayed neutrons is lower than than that for prompt neutrons.

b. B is larger than Beff since the average energy of delayed neutrons is higher than than that for prompt neutrons.

c. B is smaller than Beff since the average energy of delayed neutrons is lower than than that for prompt neutrons.

d. B is smaller than Beff since the average energy of delayed neutrons is higher than than that for prompt neutrons.

*ANSWER

c.

*REFERENCE (H.07)

GA Reactor Operator Training Manual, 6-9

*QUESTION H.04 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

With the reactor at a power of 10 watts and a period of 20 seconds, how long will it take for power to reach 1 KW?

a. 41 seconds

b. 59 seconds

c. 92 seconds

d. 111 seconds

*ANSWER

c.

p/po = exp[t/T]

100 = exp[t/20]

ln 100 = t/20

t = 4.60 x 20 = 92 seconds

*REFERENCE (BASED ON A.09 CHANGED NUMBERS, H.11)

GA Reactor Operator Training Manual, 6-15

*QUESTION H.05 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

How is FUEL CAN PRESSURE related to REACTIVITY during a pulse?

a. Fuel can pressure will vary linearly with the excess reactivity.

b. Fuel can pressure will vary as the square of the excess reactivity.

c. Fuel can pressure will vary linearly as the prompt excess reactivity.

d. Fuel can pressure will vary as the square of the prompt excess reactivity.

*ANSWER

c.

*REFERENCE (H.15)

GA Reactor Operator Training Manual, 6-31 to 6-62

*QUESTION H.06 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

Immediately after a pulse [approximately 1/1000 second] where is the HOTTEST part of a fuel element?

a. in the fuel cladding next to the elements

b. at the edge of the fuel elements next to the cladding

c. 1/3 of the way in to the center of the fuel elements from the edge

d. the center of the fuel elements

*ANSWER

b.

*REFERENCE (H.18)

GA Reactor Operator Training Manual, 6-31 to 6-62

*QUESTION H.07 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

In the event of a leak from a fuel element during full power operation, what are the PREDOMINANT isotopes that will be detected by the continuous air monitor?

a. nitrogen-16 and argon-41

b. fission product gasses [Kr-88 and Xe-135]

c. fission product iodine [I-131 & 133]

d. fission product daughters [Rb-88 & Cs-139]

*ANSWER

d.

*REFERENCE (H.21)

SOP IV
GA Reactor Operator Training Manual, ~~4-16~~ 5-5
Nuclear Energy, Raymond L. Murray, 1975 Pergamon Press INC.

*QUESTION H.08 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

A startup was stopped with the count rate channel reading 1000 counts/sec. After succeeding rod withdrawals you observe that the power is increasing exponentially with no further rod motion.

Which of the following properly characterizes the status of the reactor?

a. The reactor is subcritical and the count rate increase is due to build-up of delayed neutron prcursors.

b. The reactor is critical and the count rate increase is due to fission neutrons.

c. The reactor is subcritical and the count rate increase is due to Am-Be source neutrons.

d. The reactor is critical and the count rate increase is due to the build up of Am-Be source neutrons.

*ANSWER

Deleted

*REFERENCE $ (C.05) (H.22)

GA Reactor Operator Training Manual, 1-15 & 6-16
SOP V

*QUESTION H.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For General Atomic's, Torrey Pines MARK I reactor:

Which one of the following represents the PRINCIPAL REFLECTOR used?

a. water

b. zirconium

c. aluminum

d. graphite

*ANSWER

d.

*REFERENCE $ (A.01)

GA Reactor Operator Training Manual, pg. 1-16
GA Reactor Operator Training Manual, pg. 6-7

*QUESTION H.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For General Atomic's, Torrey Pines MARK F reactor:

Which one of the following represents the PRINCIPAL REFLECTOR used?

a. water

b. zirconium

c. aluminum

d. graphite

*ANSWER

a.

*REFERENCE $ (A.02)

GA Reactor Operator Training Manual, pg. 1-16
GA Reactor Operator Training Manual, pg. 6-7

*QUESTION H.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which one of the following statements corectly describes the property of a GOOD MODERATOR?

a. It slows down fast neutrons to thermal energy levels via a large number of collisions.

b. It slows down fast neutrons to thermal energy levels via a small number of collisions.

c. It slows down prompt neutrons to thermal energy levels via a small number of collisions.

d. It slows down prompt neutrons to thermal energy levels via a large number of collisions.

*ANSWER

b.

*REFERENCE $ (A.04)

GA Reactor Operator Training Manual, pg. 6-6

*QUESTION H.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK I reactor is at a power of 0.1 watt. 25 cents of reactivity is inserted. Assuming, Lamda-eff = 0.08 and Beff = 0.007:

What is the resulting stable reactor period?

a. 48 seconds

b. 36 seconds

c. 28 seconds

d. 22 seconds

*ANSWER

b.

deltaK/K = .25 x .007 = .0018

T = L + ////// [Beff - deltaK/K] / Lamda-eff x deltaK/K

T = [0.007 - 0.0018]/[0.0018 x 0.08] "L" can be neglected

T = 0.0052/[0.0018 x 0.08]

T = 36 seconds

*REFERENCE # (A.06)

GA Reactor Operator Training Manual, pg. 6-15

*QUESTION H.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK F reactor was shutdown after an extended high power run.

How long will it take for the MAXIMUM xenon POISON effect to occur?

a. 20 to 40 hours

b. 5 to 7 hours

c. 1 to 3 hours

d. Immediately

*ANSWER

b.

*REFERENCE # (A.07)

GA Reactor Operator Training Manual, pg. 6-25

*QUESTION H.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

How is PEAK POWER related to REACTIVITY during a pulse?

a. Peak power will vary linearly with the prompt excess reactivity.

b. Peak power will vary as the square of the excess reactivity.

c. Peak power will vary as the square of the prompt excess reactivity.

d. Peak power will vary linearly with the excess reactivity.

*ANSWER

c.

*REFERENCE $ (A.08)

GA Reactor Operator Training Manual, pg. 6-33 through 6-46

*QUESTION H.15 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The Mark F reactor is subcritical with a Keff of 0.96 and 30 counts per second indicated. After a fuel element is removed the count rate drops to 10 counts per second. No other changes have occurred.

What is the Keff of the core with the fuel element removed?

a. 0.9733

b. 0.8800

c. 0.8400

d. 0.6666

*ANSWER

b.

CR1/CR2 = [1 - Keff2] / [1 - Keff1]

30/10 = [1 - Keff] / [1 - 0.96]

1 - Keff = 3 x 0.04 = 0.12

Keff = 0.8800

*REFERENCE * (A.09)

GA Reactor Operator Training Manual, pg. 6-16

*QUESTION H.16 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The core reactivity is affected if a void, such as an empty speciman container filled with air, is inserted.

What is the reactivity effect for a 1% water void in the MARK-I reactor:

a. NEGATIVE reactivity of about 10-6 % delta-K/K.

b. NEGATIVE reactivity of about 10-3 % delta-K/K.

c. POSITIVE reactivity of about 10-6 % delta-K/K.

d. POSITIVE reactivity of about 10-3 % delta-K/K.

*ANSWER

b.

*REFERENCE $ (A.10)

GA Reactor Operator Training Manual, pg. 6-23 & Appendix B

*QUESTION H.17 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The core reactivity is affected if a void, such as an empty speciman container filled with air, is inserted.

What is the reactivity effect for a 1% water void in the MARK-F reactor:

a. NEGATIVE reactivity of about 10-6 % delta-K/K.

b. NEGATIVE reactivity of about 10-3 % delta-K/K.

c. POSITIVE reactivity of about 10-6 % delta-K/K.

d. POSITIVE reactivity of about 10-3 % delta-K/K.

*ANSWER

a.

Deleted.

*REFERENCE $ (A.11)

GA Reactor Operator Training Manual, pg. 6-23 & Appendix B

*QUESTION H.18 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which one of the following most closly approximates "Reactor Period?"

a. The time in seconds for the neutron population to increase by a factor of nearly 1.333.

b. The time in seconds for the neutron population to increase by a factor of nearly 1.718.

c. The time in seconds for the neutron population to increase by a factor of nearly 2.333.

d. The time in seconds for the neutron population to increase by a factor of nearly 2.718.

*ANSWER

d.

*REFERENCE ¶ (A.12)

GA Reactor Operator Training Manual, pg. 6-9 through 6-16

*QUESTION H.19 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

When referring to the reactivity of the MARK 1 reactor core:

Which one of the following statements correctly explains the equivalence of net dollar of reactivity?

a. One dollar [$1.00] is equivalent to Beff = 0.0073 delta-K/K.

b. One dollar [$1.00] is equivalent to Keff = 1.00 delta-K/K.

c. One dollar [$1.00] is equivalent to Beff = 1.00 delta-K/K.

d. One dollar [$1.00] is equivalent to Keff = 0.0073 delta-K/K.

*ANSWER

a.

*REFERENCE * (A.13)

BA Reactor Operator Training Manual, pg. 6-9 through 6-16

*QUESTION H.20 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

TRIGA reactors are not permitted to be pulsed from power levels above 1kW.

Which one of the following statements correctly describes the reason for this requirement?

a. The additional fast neutron flux from the pulse could dangerously embrittle fuel cladding.

b. The additional heat from the pulse could cause pool temperature limits to exceed operating specifications.

c. The additional thermal neutron flux from the pulse could dangerously embrittle fuel cladding.

d. The additional heat from the pulse could cause fuel temperature limits to exceed operating specifications.

*ANSWER

d.

*REFERENCE $ (A.14)

GA Reactor Operator Training Manual, pg. 6-31 through 6-63

*QUESTION H.21 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The basic parameter which permits the MARK I reactor system to operate safely during either steady-state or pulsing conditions is the prompt negative temperature coefficient.

Which of the following effects is the PRIMARY contributor to this design characteristic under these conditions?

a. doppler effects

b. core leakage

c. core spectrum-hardening

d. core voiding

*ANSWER

c.

*REFERENCE # (A.15)

GA Reactor Operator Training Manual, pg. 6-52 / 6-22

*QUESTION H.22 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

If the reactivity and the temperature changes in the same direction, the bath coefficient is "positive." If the reactivity and the temperature changes in the opposite direction, the bath coefficient is "negative."

Which of the following correctly describe the characteristics of the bath coefficient in the low-hydride and high-hydride standard fuel?

a. The bath coefficient is SMALL but positive in the room temperature region, becoming negative at higher temperatures.

b. The bath coefficient is negative at all temperatures, but INCREASES in magnitude over the entire operating temperature range.

c. The bath coefficient is LARGE but negative in the room temperature region, becoming positive at higher temperatures.

d. The bath coefficient is positive at all temperatures, but DECREASES in magnitude over the entire operating temperature range.

*ANSWER

a.

*REFERENCE $ (C.01)

GA Reactor Operator Training Manual, pp. VI-21 to VI-22

*QUESTION H.23 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

If the reactivity and the temperature changes in the same direction, the bath coefficient is "positive." If the reactivity and the temperature changes in the opposite direction, the bath coefficient is "negative."

Which of the following correctly describe the characteristics of the bath coefficient in standard FLIP fuel?

a. The bath coefficient is SMALL but positive in the room temperature region, becoming negative at higher temperatures.

b. The bath coefficient is negative at all temperatures, but INCREASES in magnitude over the entire operating temperature range.

c. The bath coefficient is LARGE but negative in the room temperature region, becoming positive at higher temperatures.

d. The bath coefficient is positive at all temperatures, but DECREASES in magnitude over the entire operating temperature range.

Deleted

*ANSWER

b.

*REFERENCE $ (C.02)

GA Reactor Operator Training Manual, pp. VI-21 to VI-22

*QUESTION H.24 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The operating characteristics of both the MARK 1 and MARK F reactor systems cause the reactor response to be much more linear than exponential in their response to reactivity changes.

What is the reason for this behavior?

a. the short delay time for transferring heat to the cooling water coupled with the large prompt negative temperature coefficient.

b. the short delay time for transferring heat to the cooling water coupled with the large prompt positive temperature coefficient.

c. the long delay time for transferring heat to the cooling water coupled with the large prompt positive temperature coefficient.

d. the long delay time for transferring heat to the cooling water coupled with the large prompt negative temperature coefficient.

*ANSWER

d.

*REFERENCE $ (C.03)

GA Reactor Operator Training Manual, pp. VI-22

END OF CATEGORY H
GO ON TO CATEGORY I

CATEGORY I
RADIOACTIVE MATERIALS
HANDLING, DISPOSAL, AND HAZARDS

*QUESTION I.01 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The portable survey instruments available at the GA Torrey Pines facilities are used to detect the presence of ionizing radiation. One type of instrument uses a pancake like detector on the end of a 2 foot coaxial cable. The detector is sensitive to both gamma and beta low energy radiation, which supports four range settings on the instrument from 500 CPM to 500,000 CPM full scale.

Which ONE of the following portable survey instruments fits this description?

a. Geiger counter (Ludlum Model 3)

b. Snoopy (NP-2)

c. Eberline PAC 1SA

d. Juno Model

*ANSWER

a.

*REFERENCE $ (G.01)

GA Reactor Operator Training Manual, V-14 to V-15

*QUESTION I.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The portable survey instruments available at the GA Torrey Pines facilities are used to detect the presence of ionizing radiation. One type of instrument is mainly used as a general survey meter. It is an ion-chamber and is capable of quantitative measurements of beta and gamma radiation. It has a range of 2.5 mR/hr to 250 R/hr full scale.

Which ONE of the following portable survey instruments fits this description?

a. Geiger counter (Ludlum Model 3)

b. Snoopy (NF-2)

c. Eberline PAC 1SA

d. Juno Model

*ANSWER

d.

*REFERENCE # (G.02)

GA Reactor Operator Training Manual, V-14 to V-15

*QUESTION I.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which ONE of the following portable survey instruments detects ALPHA radiation using a scintillation-type detector?

a. Geiger counter (Ludlum Model 3)

b. Snoopy (NP-2)

c. Eberline PAC 1S4

d. Juno Model

*ANSWER

c.

*REFERENCE $ (G.03)

GA Reactor Operator Training Manual, V-15

*QUESTION I.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The NEUTRON radiation detector, available at GA, has a radiometer that reads full scale 2 mRem/hr in four ranges [x1, x 10, x100, and x1000].

Which ONE of the following portable survey instruments fits this description?

a. Geiger counter (Ludlum Model 3)

b. Snoopy (NP-2)

c. Eberline PAC 1SA

d. Juno Model

*ANSWER

b.

*REFERENCE $ (G.04)

GA Reactor Operator Training Manual, V-15

*QUESTION I.05 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which is one of the characteristics of fast NEUTRON type radiation?

a. it has more penetrating power than BETA radiation

b. it has less ionizing power than BETA radiation

c. it is usually classified as having a positive charge

d. it is electromagnetic radiation

*ANSWER

a.

*REFERENCE $ (G.05)

Nuclear Energy, Raymond L. Murray, 1975 Pergamon Press INC.
GA Reactor Operator Training Manual, Chapter V

*QUESTION I.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which is one of the characteristics of ALPHA radiation?

a. it has more penetrating power than BETA radiation

b. it has less ionizing power than BETA radiation

c. it is usually classified as having a positive charge

d. it is electromagnetic radiation

*ANSWER

c.

*REFERENCE $ (G.06)

Nuclear Energy, Raymond L. Murray, 1975 Pergamon Press INC.
GA Reactor Operator Training Manual, Chapter V

*QUESTION I.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Ingestion of what type of radioactive materials will cause the most internal biological damage due to cell ionization?

a. BETA emitters

b. GAMMA emitters

c. XRAY emitters

d. ALPHA emitters

*ANSWER

d.

*REFERENCE $ (G.07)

Nuclear Energy, Raymond L. Murray, 1975 Pergamon Press INC.
GA Reactor Operator Training Manual, Chapter V

*QUESTION I.08 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The continuous monitors used at the TRIGA Reactors Facility are usually "fixed position" detectors and are used to warn of fuel/experiment failure, or other hazardous radiological event.

Which of the following devices is used to satisfy the Technical Specification requirement for activating the evacuation alarm?

a. Continuous Air Monitor (CAM)

b. RM-12

c. Radiation Area Monitor (RAM)

d. Eberline RM-14

*ANSWER

c. Deleted

*REFERENCE # (G.08)

GA Reactor Operator Training Manual, Chapter V-17 to V-24
GA Technical Specifications, MK-1 & MK-F

*QUESTION I.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The continuous monitors used at the TRIGA Reactors Facility are usually "fixed position" detectors and are used to warn of fuel/experiment failure, or other hazardous radiological event.

Which of the following devices is for high gamma field radiation detection and activates the "criticality" alarm?

a. Continuous Air Monitor (CAM)

b. RM-12

c. Radiation Area Monitor (RAM)

d. Eberline RM-14

*ANSWER

b.

*REFERENCE $ (G.09)

GA Reactor Operator Training Manual, Chapter V-17 to V-24

*QUESTION I.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The continuous monitors used at the TRIGA Reactors Facility are usually "fixed position" detectors and are used to warn of fuel/experiment failure, or other hazardous radiological event.

Which of the following devices is mounted on top of the reactor tank and maintains a chronological record of activity via a chart recorder?

a. Continuous Air Monitor (CAM)

b. RM-12

c. Radiation Area Monitor (RAM)

d. Eberline RM-14

*ANSWER

a.

*REFERENCE $ (G.10)

GA Reactor Operator Training Manual, Chapter V-17 to V-24

*QUESTION I.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the 10CFR20 limit for exposure to the SKIN of the whole body?

a. 1.25 rem/calender quarter

b. 3.0 millirem/calender quarter

c. 7.5 rem/calender quarter

d. 18.75 rem/calender quarter

*ANSWER

c.

*REFERENCE $ (G.11)

GA Reactor Operator Training Manual, Chapter V-30 to V-31
10CFR20

*QUESTION I.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the 10CFR20 limit for exposure to the hands and feet?

a. 1.25 rem/calender quarter

b. 3.0 millirem/calender quarter

c. 7.5 rem/calender quarter

d. 18.75 rem/calender quarter

*ANSWER

d.

*REFERENCE $ (G.12)

GA Reactor Operator Training Manual, Chapter V-30 to V-31
10CFR20

*QUESTION I.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

A sealed specimen container which is more radioactive than ecpected was dropped on the laboratory floor. The resulting dose rate due to the specimen and activated container at ten feet is 25 mR/hr. Assuming that the efficiency of the detector does not change and that background is negligible:

What is the dose rate at a distance of one [1] foot?

a. 250 mR/hr

b. 2500 mR/hr

a. 25000 mR/hr

b. 250000 mR/hr

*ANSWER

b.

D2 = D1 x [d1/d2]^2

D2 = 25 x 100 = 2500 mR/hr

*REFERENCE $ (G.13)

Standard Distance-Time-Shielding calculation, previous Facility reviewed examinations;
Examination Equation Sheet

*QUESTION I.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which of the following correctly describes the access limitations to the TRIGA Reactors Facility for a pregnant woman?

a. Pregnant woman shall be admitted ONLY with the permission of the Physicist In Charge (PIC).

b. Pregnant woman shall be admitted if their whole body exposure is limited to 500 Rem during their pregnancy.

c. Pregnant woman shall NEVER be permitted into the Facility.

d. Pregnant woman shall be admitted ONLY with the permission of the Managing Director, TRIGA Group.

*ANSWER

c.

*REFERENCE $ (G.14)

GA Administrative Procedures, pp. 19

*QUESTION I.15 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

Which of the following terms describes the number of nuclear transformations occurring per unit time?

a. Ergs

b. Coulombs

c. Roentgens

d. Curies

*ANSWER

d.

*REFERENCE $ (I.01)

Radiological Safety, V
Nuclear Energy, Raymond L. Murray, 1975, Pergamon Press INC.

*QUESTION I.16 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

What are the PRIMARY RADIOACTIVE gases of concern that could be released if a DRY beam tube were broken during TRIGA operation?

a. Oxygen-16 & Xenon-136

b. uranium hexafloride gas & ammonia

c. tritium vapor & fluoride

d. Argon-41 & Nitrogen-16

*ANSWER

d.

*REFERENCE $ (MODIFIED I.02 for GA)

Radiological Safety, V
Nuclear Energy, Raymond L. Murray, 1975, Pergamon Press INC.

*QUESTION I.17 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

A large rectangular pipe can be installed on top of the MARK 1 graphite reflector to provide a neutron beam for radiography. A large cylindrical beam stop is suspended above the source pipe to reduce the neutron dosage to the surrounding area.

What is the beam stop made of?

a. parraffin, borax, and lead

b. wax, BF3, and tile

c. ceramic, graphite, and wax

d. carbon compound, Cadmium, and gelatin

*ANSWER

a.

*REFERENCE (NEW, I.04 FROM SAMPLE TUBE TO DRIVE SHAFT)

GA Reactor Operator Training Manual, 1-41

*QUESTION I.18 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

How does the transfer system function to MINIMIZE contamination while inserting and removing samples from the terminus in the core?

a. The blower exhausts through a filter into the reactor room exhaust duct and pressurizes the system to move the sample into and out of the terminus.

b. The blower exhausts through a filter into the reactor room exhaust duct and draws a vacuum on the system to move the sample into and out of the terminus.

c. The blower draws air through a filter from the reactor room exhaust duct and pressurizes the system to move the sample into and out of the terminus.

d. The blower draws air through a filter from the reactor room exhaust duct and draws a vacuum on the system to move the sample into and out of the terminus.

*ANSWER

b.

*REFERENCE $ (MODIFIED I.05 TO REFLECT GA REFERENCES)

GA Reactor Operator Training Manual, 1-41

*QUESTION I.19 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

Which of the following would be the best absorber for high energy [> 1 Mev.] gamma radiation?

a. lead bricks

b. water

c. polyethylene blocks

d. aluminum

*ANSWER

a.

*REFERENCE $ (G.07) (I.15 MODIFIED FOR GA REFERENCES)

Radiological Safety, V
Nuclear Energy, Raymond L. Murray, 1975, Pergamon Press INC.

*QUESTION I.20 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

The quality factor [QF] relates absorbed dose to dose equivalent for persons exposed to ionizing radiation.

What is the QF for THERMAL NEUTRON radiation?

a. 20

b. 10

c. 3

d. 1 QF = 5

*ANSWER

c. Deleted

*REFERENCE (I.17, MODIFIED FOR GA)

Radiological Safety, V
Nuclear Energy, Raymond L. Murray, 1975, Pergamon Press INC.

*QUESTION I.21 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

An individual who is twenty [20] years in age has started working with radioactive material. This person's accumulated occupational whole body radiation dose is zero [0.0] Rem and this is documented on a form NRC-4. Based on the requirements of the Code of Federal Regulations [10CFR20]:

What is the MAXIMUM PERMISSIBLE whole body dose that this person would be allowed to receive THIS YEAR? ← CONFUSING

a. 3 Rem

b. 5 Rem

c. 10 Rem

d. 12 Rem

*ANSWER

c.

5 x [N-18] = 5 x [20-18] = 5 x 2 = 10 Rem

*REFERENCE (I.25, modified for GA)

Radiological Safety. V 10CFR20.101[b] DELETED

*QUESTION I.22 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

A survey of radiation levels in the MARK F reactor room has been made by Health Physics personnel. The survey indicates 180 mRem/hr above background. A trace of I-135 airborne activity was detected at 1 x 10^-18 microcuries/ml. Based only on the results of this survey:

What minimum posting is required for the MARK F reactor room?

a. YELLOW ROPE across LOCKED access door

b. CAUTION HIGH RADIATION AREA sign

c. CAUTION RADIATION AREA sign

d. CAUTION AIRBORNE RADIOACTIVITY AREA sign

*ANSWER

b.

*REFERENCE

Radiological Safety, V
10CFR20

*QUESTION I.23 [1.00]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER.

A survey of radiation levels in the MARK F reactor room has been made by Health Physics personnel. The survey indicates 7 mRem/hr above background. A trace of I-135 airborne activity was detected at 1 x 10^-18 microcuries/ml. Based only on the results of this survey:

What minimum posting is required for the MARK F reactor room?

a. YELLOW ROPE across LOCKED access door

b. CAUTION HIGH RADIATION AREA sign

c. CAUTION RADIATION AREA sign

d. CAUTION AIRBORNE RADIOACTIVITY AREA sign

*ANSWER

c.

*REFERENCE

Radiological Safety, V
10CFR20

END OF CATEGORY I
GO ON TO CATEGORY J

CATEGORY J
SPECIFIC OPERATING CHARACTERISTICS

*QUESTION J.01 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The reactor pits of both the MARK 1 and MARK F reactors are similar in that they are made primarily of concrete, encompassing a cylindrical tank.

What is the material composition of the MARK 1 reactor pit cylindrical tank?

a. iron

b. steel

c. aluminum

d. zirconium

*ANSWER

c.

*REFERENCE $ (B.01)

GA Reactor Operator Training Manual, pp. 1-5 through 1-6

*QUESTION J.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The reactor pits of both the MARK 1 and MARK F reactors are similar in that they are made primarily of concrete, encompassing a cylindrical tank.

What is the material composition of the MARK F reactor pit cylindrical tank?

a. iron

b. steel

c. aluminum

d. zirconium

*ANSWER

b.

*REFERENCE $ (B.02)

GA Reactor Operator Training Manual, pp. 1-5 through 1-6

*QUESTION J.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Primary cooling water provides a vertical radiation shield for both the MARK 1 and MARK F reactor designs.

How many feet of vertical shield water is normally provided by the MARK 1 reactor design?

a. 12 feet

b. 16 feet

c. 20 feet

d. 24 feet

*ANSWER

b.

*REFERENCE # (B.03)

GA Reactor Operator Training Manual, pp. 1-5 through 1-6

*QUESTION J.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Primary cooling water provides a vertical radiation shield for both the MARK 1 and MARK F reactor designs.

How many feet of vertical shield water is normally provided by the MARK F reactor design?

a. 12 feet

b. 16 feet

c. 20 feet

d. 24 feet

*ANSWER

c.

*REFERENCE $ (B.04)

GA Reactor Operator Training Manual, pp. 1-5 through 1-6

*QUESTION J.05 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the PRIMARY cooling water mode of both the MARK 1 and MARK F reactors?

a. radiation

b. forced convection

c. natural conduction

d. natural convection

*ANSWER

d.

*REFERENCE $ (B.05)

GA Reactor Operator Training Manual, pp. 1-4

*QUESTION J.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For the MARK 1 reactor:

What is the worth of a standard control rod?

a. $1.50

b. $2.00

c. $3.00

d. $5.50

*ANSWER

b.

*REFERENCE $ (C.06)

GA Reactor Operator Training Manual, pp. 1-23
GA Reactor Operator Training Manual, APPENDIX B

*QUESTION J.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For the MARK 1 reactor:

What is the worth of the transient control rod?

a. $1.50

b. $2.00

c. $3.00

d. $5.50

*ANSWER

c.

*REFERENCE $ (C.07)

GA Reactor Operator Training Manual, pp. 1-23
GA Reactor Operator Training Manual, APPENDIX B

*QUESTION J.08 [1.0]

MULTIPLE CHOICE. SELECT THE CORRECT ANSWER

For the MARK F reactor:

What is the worth of the transient control rod?

a. $1.50

b. $2.00

c. $3.00

d. $5.50

* Deleted 10/31/89 During Exam For Chief Examiner

*ANSWER

d.

*REFERENCE $ (C.08)

GA Reactor Operator Training Manual, pp. 1-23
GA Reactor Operator Training Manual, APPENDIX B

* Transient rod removed from core.

*QUESTION J.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the withdraw time for the standard SHIM rod?

a. 25 seconds

b. 35 seconds

c. 45 seconds

d. 55 seconds

*ANSWER

c.

*REFERENCE $ (D.02)

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION J.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the withdraw time for the standard REG rod?

a. 25 seconds

b. 35 seconds

c. 45 seconds

d. 55 seconds

*ANSWER

c.

*REFERENCE 1 (D.03)

GA Reactor Operator Training Manual, pp. 2-23

#QUESTION J.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the maximum length of travel for the MARK 1 control rods?

a. 15-1/4-inches for all rods, except the transient rod which can move 30 inches.

b. 15-1/4-inches for all rods, including transient rod.

c. 18-inches for all rods, except the transient rod which can only move 30 inches.

d. 18-inches for all rods, including transient rod.

#ANSWER

b.

#REFERENCE $ (D.04)

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION J.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

How is the electrical position indication developed for the standard SHIM and REG control rod drives?

a. a magnetic pickup counts the number of revolutions of the drive motor, which are summed to give position indication.

b. a tachometer, set-up as an integrator, is connected to the drive motor, which raises and lowers the rod.

c. a 10-turn potentiometer, driven by a separate two-phase motor, provides position indication.

d. a helipot is connected to the pinion gear, which raises and lowers the rod.

*ANSWER

c.

DELETED

*REFERENCE $ (D.05)

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION J.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the length of the "follower" sections of a standard MARK-F control rods?

a. 15-1/4 inches for an aluminum follower and 18 inches for a poison follower.

b. 15-1/4 inches for both the aluminum and poison followers.

c. 18 inches for an aluminum follower and 15-1/4 inches for a poison follower.

d. 18 inches for both the aluminum and poison followers.

*ANSWER

d.

*REFERENCE $ (D.06)

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION J.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the reason for adding a follower extension to a standard MARK-F control rod?

a. to only increase the rod worth of the standard rod

b. to change the rod worth as desired by varying the type of material used in the follower extention

c. to only decrease the rod worth of the standard rod

d. to add additional structural support to the control rod during thermionic testing

%ANSWER

b.

*REFERENCE $ (D.07)

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION J.15 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the function of a "flux trap" type of follower on a standard MARK-F control rod?

a. to only increase the rod worth of the standard rod

b. to change the rod worth as desired by varying the type of material used in the follower extention

c. to only decrease the rod worth of the standard rod

d. to add additional structural support to the control rod during thermionic testing

*ANSWER

a.

*REFERENCE $ (D.08)

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION J.16 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The motor drives for the MARK-1 and MARK-F reactor control rods are essentially the same except that the dashpot device has been modified for the MARK-F.

What is the purpose of the dashpot device?

a. To facilitate the speed adjustment of the transient rod drive for some experiments.

b. To reduce the impact stress effects on the transient control rod after a pulse.

c. To facilitate the speed adjustment of the rod drive motors for some experiments.

d. To reduce the bottoming impact stress effects on the control rod after a reactor trip.

*ANSWER

d.

*REFERENCE $ (D.09)

GA Reactor Operator Training Manual, pp. 2-23 to 2-29

*QUESTION J.17 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The motor drives for the MARK-1 and MARK-F reactor control rods are essentially the same except that the dashpot device has been modified for the MARK-F.

What is the difference between the dashpot devices used in the two reactors?

a. The speed adjustment of the transient rod drive for some experiments on the MARK-F.

b. The location of the dashpot on the MARK-F rods was moved to a location well above the water level.

c. The speed adjustment of the standard rod drive motors for some experiments on the MARK-1.

d. The location of the dashpot on the MARK-F rods was moved to a location well below the water level.

*ANSWER

b.

*REFERENCE $ (D.10)

GA Reactor Operator Training Manual, pp. 2-23 to 2-29

*QUESTION J.18 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which of the following detectors are used by the MARK 1 reactor NPP-1000 safety/pulse channel?

a. fission counter detector

b. compensated ion chamber detector

c. scintillation counter detector

d. uncompensated ion chamber detector

*ANSWER

d.

*REFERENCE $ (D.11)

GA Reactor Operator Training Manual, pp. 2-51 to 2-54

*QUESTION J.19 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which of the following detectors are used by the MARK 1 reactor NP-1000 safety channel?

a. fission counter detector

b. compensated ion chamber detector

c. scintillation counter detector

d. uncompensated ion chamber detector

*ANSWER

d.

*REFERENCE # (D.12)

GA Reactor Operator Training Manual, pp. 2-51 to 2-54

*QUESTION J.20 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The types of nuclear instrumentation used at the Torrey Pines reactor facilities varies to accomodate the wide range of reactor power that must be monitored. The MARK F reactor piccoammeter (K1), within the linear power channel, provides an indication range from source level to approximately 400 kw steady state operation.

Which of the following detectors are used by the K1?

a. fission counter detector

b. compensated ion chamber detector

c. scintillation counter detector

d. uncompensated ion chamber detector

*ANSWER

b.

*REFERENCE $ (D.13)

GA Reactor Operator Training Manual, pp. 2-51 to 2-54

*QUESTION J.21 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The types of nuclear instrumentation used at the Torrey Pines reactor facilities varies to accomodate the wide range of reactor power that must be monitored. The MARK 1 reactor NM-1000 Operational Channel provides 10 decades of power indication, from shutdown to full power.

Which of the following detectors are used by the NM-1000?

a. fission counter detector

b. compensated ion chamber detector

c. scintillation counter detector

d. uncompensated ion chamber detector

*ANSWER

a.

*REFERENCE $ (D.14)

GA Reactor Operator Training Manual, pp. 2-51 to 2-54

*QUESTION J.22 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For the MARK 1 reactor:

What is the approximate value of the reactivity loss due to equilibrium XENON at 200 KW steady state power?

a. 1 x 10-2 delta K/K

b. 1 x 10-3 delta K/K

c. 1 x 10-4 delta K/K

d. 1 x 10-5 delta K/K

*ANSWER

a.

*REFERENCE $ (C.04)

GA Reactor Operator Training Manual, pp. VI-26 to VI-28

*QUESTION J.23 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For the MARK 1 reactor, after a start up from a stable shutdown condition to 200 kw steady state power, approximately:

How long does it take for Xenon to reach equilibrium concentration for this power level?

a. 10 to 20 hours

b. 30 to 40 hours

c. 60 to 70 hours

d. 80 to 90 hours

*ANSWER

c.

*REFERENCE $ (C.05)

GA Reactor Operator Training Manual, pp. VI-28

#QUESTION J.24 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

There is a reliable "rule of thumb" correlating reactivity insertion and increasing power on the MARK 1 reactor.

What is this "rule of thumb?"

a. one cent per kilowatt

b. one % delta-K/K per kilowatt

c. one cent per watt

d. one % delta-K/K per watt

#ANSWER

a.

#REFERENCE $ (C.12)

TRIGA TRAINING PROGRAM QUESTIONS

END OF CATAGORY J
GO ON TO CATEGORY K

CATEGORY K
FUEL HANDLING AND CORE PARAMETERS

*QUESTION K.01 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Based on GA TECHNICAL SPECIFICATIONS for the MARK I reactor:

What is the the maximum temperature limit for the standard HIGH hydride fuel elements in the MARK I core?

a. 1500 degrees C

b. 1030 degrees C

c. 800 degrees C

d. 530 degrees C

*ANSWER

c.

*REFERENCE $ (B.06)

GA TECHNICAL SPECIFICATIONS, 7.4

*QUESTION K.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Based on GA TECHNICAL SPECIFICATIONS for the MARK I reactor:

What is the the maximum temperature limit for the standard LOW hydride fuel elements in the MARK I core?

a. 1500 degrees C

b. 1030 degrees C

c. 800 degrees C

d. 530 degrees C

*ANSWER

d.

*REFERENCE $ (B.07)

GA TECHNICAL SPECIFICATIONS, 7.4

*QUESTION K.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the material composition of the MARK F's standard FLIP unirradiated fuel?

a. Maximum uranium content of 9.0 wt.% with a maximum enrichment of 20%.

b. Maximum plutonium content of 9.0 wt.% with a nominal addition of 70% Pu-239.

c. Maximum uranium content of 9.0 wt.% with a nominal enrichment of 70%.

d. Maximum plutonium content of 9.0 wt.% with a maximum addition of 20% Pu-239.

*ANSWER

c.

*REFERENCE $ (B.11)

GA TECHNICAL SPECIFICATIONS - MK F

*QUESTION K.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the material composition of the MARK F's standard control rod or transient rod?

a. graphite impregnated with boron

b. compected and sintered boron carbide

c. boron carbide mixed with ziconium hydride

d. boron carbide mixed with aluminum oxide

*ANSWER

a.

*REFERENCE $ (B.13)

GA Reactor Operator Training Manual, pp. 1-22 through 1-23

*QUESTION K.05 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the material composition of the MARK I's standard control rod or transient rod?

a. graphite impregnated with boron

b. compacted and sintered boron carbide

c. boron carbide mixed with ziconium hydride

d. boron carbide mixed with aluminum oxide

*ANSWER

d.

*REFERENCE # (B.14)

GA Reactor Operator Training Manual, pp. 1-22 through 1-23

*QUESTION K.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Common fuel element inspection tools are used to measure TWO specific fuel element parameters.

What are these TWO parameters?

a. bulging and elongation

b. bowing and elongation

c. bulging and out of roundness

d. bowing and out of roundness

*ANSWER

b.

*REFERENCE # (C.15)

GA Reactor Operator Training Manual, pp. 1-45 to 1-50

*QUESTION K.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK 1 reactor fuel temperature safety channels are redundant, fail-safe monitors of fuel temperature. The channels will scram the reactor when the trip limit is reached.

What is this trip limit?

a. 500 degrees F

b. 800 degrees C

c. 500 degrees C

d. 800 degrees F

*ANSWER

c.

*REFERENCE $ (E.01)

GA Reactor Operator Training Manual, pp. 2-19

*QUESTION K.08 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK 1 reactor fuel temperature safety channels are redundant, fail-safe monitors of fuel temperature.

What kind of temperature sensors provide the functional instrument signal to these channels?

a. Resistance Temperature Detector (RTD)

b. Type K thermocouples

c. Thermistor Type Device (TTD

d. Type K doppler resonators

*ANSWER

b.

*REFERENCE $ (E.02)

GA Reactor Operator Training Manual, pp. 2-19

*QUESTION K.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK 1 reactor fuel temperature safety channels are redundant, fail-safe monitors of fuel temperature.

Where are the temperature sensors associated with these channels physically located?

a. within instrumented fuel elements.

b. integrated with the excore nuclear instrumentation.

c. within instrumented poison elements.

d. integrated with the incore nuclear instrumentation.

*ANSWER

a.

*REFERENCE $ (E.03)

GA Reactor Operator Training Manual, pp. 2-19

*QUESTION K.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Two types of temperature probes are used to monitor the TRIGA MARK 1 pit water temperature. One of these is made out of platinum and feeds a signal to the Control System Console (CSC) via the Data Aquisition and Control Unit (DAC).

What type of temperature detector is in the probe that feeds CSC pool temperature indication?

a. Resistance Temperature Detector (RTD)

b. Type K thermocouples

c. Thermistor Type Device (TTD)

d. Type K doppler resonator

*ANSWER

a.

*REFERENCE $ (E.04)

GA Reactor Operator Training Manual, pp. 2-33

*QUESTION K.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Two types of temperature probes are used to monitor the TRIGA MARK 1 pit water temperature. One of these feeds a digital monitor in the auxiliary console.

What type of temperature detector is in the probe that feeds auxiliary console pool temperature indication?

a. Resistance Temperature Detector (RTD)

b. Type K thermocouples

c. Thermistor Type Device (TTD)

d. Type K doppler resonator

*ANSWER

c.

*REFERENCE $ (E.05)

GA Reactor Operator Training Manual, pp. 2-33

*QUESTION K.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The TRIGA MARK 1 ventilation system consists of an exhaust blower and absolute filter.

Where are the exhaust blower and absolute filter located?

a. in the attic above the MARK 1 reactor room

b. along the wall next to the storage yard

c. in the attic above the MARK F reactor room

d. along the wall next to the counting room

*ANSWER

a.

*REFERENCE $ (E.06)

GA Reactor Operator Training Manual, pp. 1-37

*QUESTION K.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The TRIGA MARK 1 ventilation system absolute filter is fit with a radiation detector that feeds a monitor in the auxiliary instrument rack. This process radiation system initiates an automatic protective function upon reaching its setpoint.

What is the setpoint for automatic function?

a. 5 R/hr.

b. 45 R/hr

c. 5 mR/hr.

d. 45 mR/hr.

*ANSWER

c.

*REFERENCE $ (E.07)

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION K.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The TRIGA MARK 1 ventilation system absolute filter is fit with a radiation detector that feeds a monitor in the auxiliary instrument rack. This process radiation system initiates an automatic protective function upon reaching its setpoint.

What is this automatic function?

a. initiates an automatic isolation of the MARK 1 ventilation system and reactor room

b. initiates an audible alarm and light in the MARK 1 control room

c. releases the interlock that blocked the manual isolation of the MARK 1 ventilation system

d. initiates a flashing amber alarm in the MARK 1 reactor room

*ANSWER

b.

*REFERENCE $ (E.08)

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION K.15 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

A release of fission products from a damaged fuel element into the MARK F reactor room has occurred.

Which design characteristic of the MARK F ventilation system minimizes the release?

a. All radiation is discharged to the MARK 1 reactor room, where the absolute filter traps it.

b. Common emergency exhaust blowers initiate so that a minimum .05 in of water under-pressure is maintained.

c. All radiation is discharged to the common vent stack where it is diluted to acceptable levels and released.

d. Gaskets are installed on all doors to the room so that a minimum .05 in of water under-pressure is maintained.

*ANSWER

d.

*REFERENCE $ (E.09)

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION K.16 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What type of radiation detector counter is mounted in the MARK 1 reactor PIT WATER monitor box?

a. Geiger-Muller counter

b. scintillation detector

c. fission chamber

d. proportional BF3 ion chamber

*ANSWER

a.

*REFERENCE $ (E.10)

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION K.17 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The radioactivity monitor system for MARK 1 PIT WATER radioactivity initiates an automatic protective function upon reaching its preset setpoint.

What is the PRESET setpoint for this automatic function?

a. 5 R/hr.

b. 45 R/hr

c. 5 mR/hr.

d. 45 mR/hr.

*ANSWER

d.

*REFERENCE $ (E.11)

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION K.18 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The radioactivity monitor system for MARK 1 PIT WATER radioactivity initiates an automatic protective function upon reaching its preset setpoint.

What is this automatic function?

a. initiates an automatic isolation of the MARK 1 ventilation system and reactor room

b. initiates a flashing amber alarm on the CSC

c. releases the interlock that blocked the manual isolation of the MARK 1 ventilation system

d. initiates an audible alarm and light

*ANSWER

d.

*REFERENCE $ (E.12)

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION K.19 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK F reactor Standard Operating Procedures for fuel loading and unloading require that all fuel moves be logged in three places. One of these places is on the fuel cards.

Which one of the following correctly describes the other two places where fuel movements must be logged and how they are logged?

a. in the logbook with black ink, and on the core display board

b. flagged with a red sticker in the logbook, and on the core display board

c. in the logbook with red ink, and on the core display board

d. flagged with a green sticker in the logbook, and on the core display board

*ANSWER

c.

*REFERENCE (K.21)

SOP XI, MARK F

QUESTION K.20 [2.00]

SHORT ANSWER

A TRIGA reactor is being loaded for criticality. The following tabulation summarizes the the number of elements added and the resulting steady state count rate. The source level [Ro] is considered to be 1000 CPM. [R/Ro = count rate/source level]

NO OF ELEMENTS	COUNT RATE [CPM]	R/Ro	Ro/R
50	3000	3.00	0.333
55	4255	4.25	0.235
60	7000	7.00	0.143

How MANY fuel elements are REQUIRED for CRITICALITY?

SHOW ALL WORK AND STATE ANY ASSUMPTION MADE!

[1.5 points for APPLICATION, 0.5 points for VALUE]

[NOTE: Use of the extrapolation method is suggested but not required. Show all work and assumptions made. Graph paper is provided on the next sheet.]

*ANSWER

[APPLICATION]:

Set up graph properly. [0.50]

Plot points correctly. [0.50]

Draw intercept properly. [0.50]

[VALUE]:

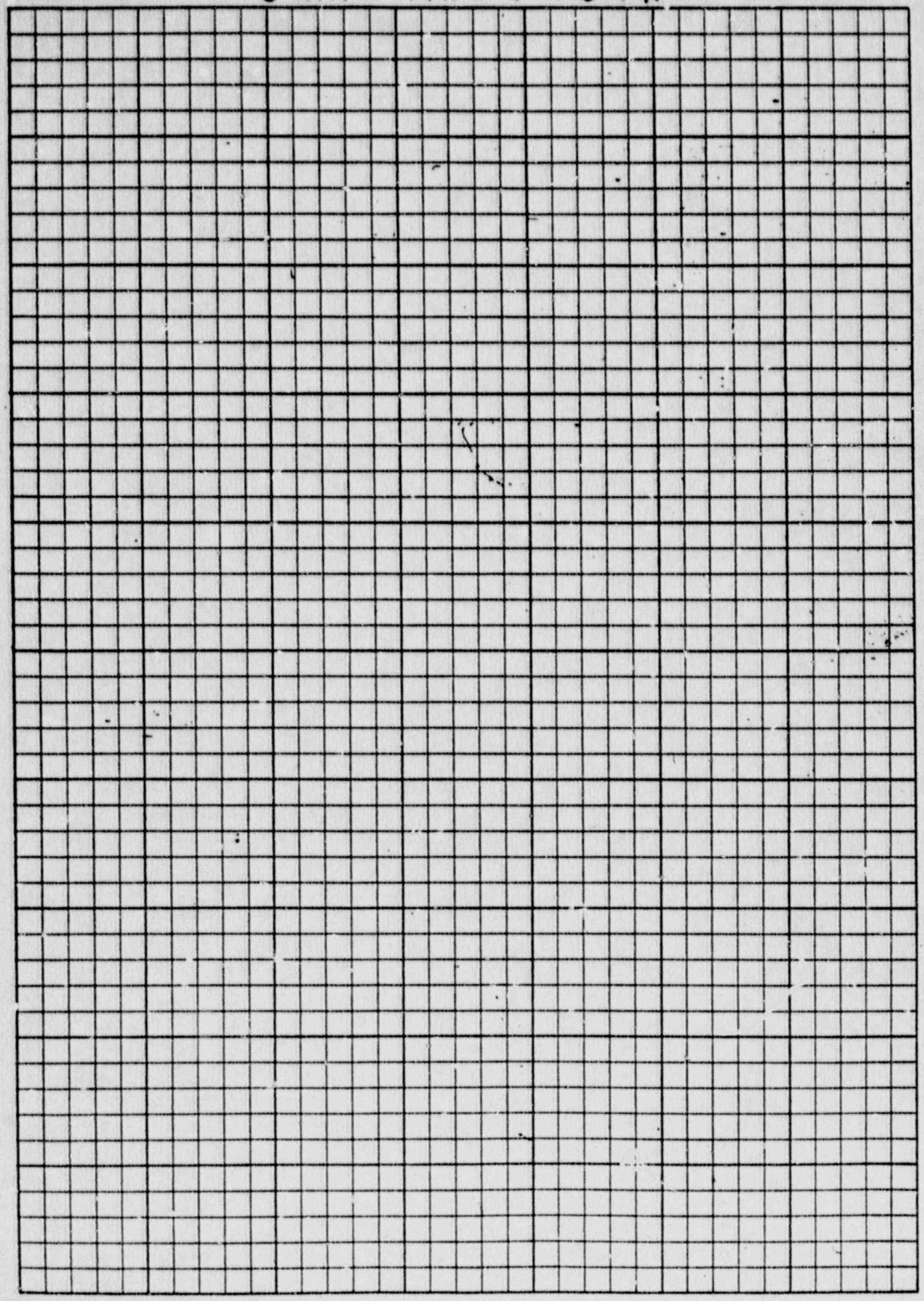
Obtain correct answer. 67 +/- _ [0.50]

See attached sheet.

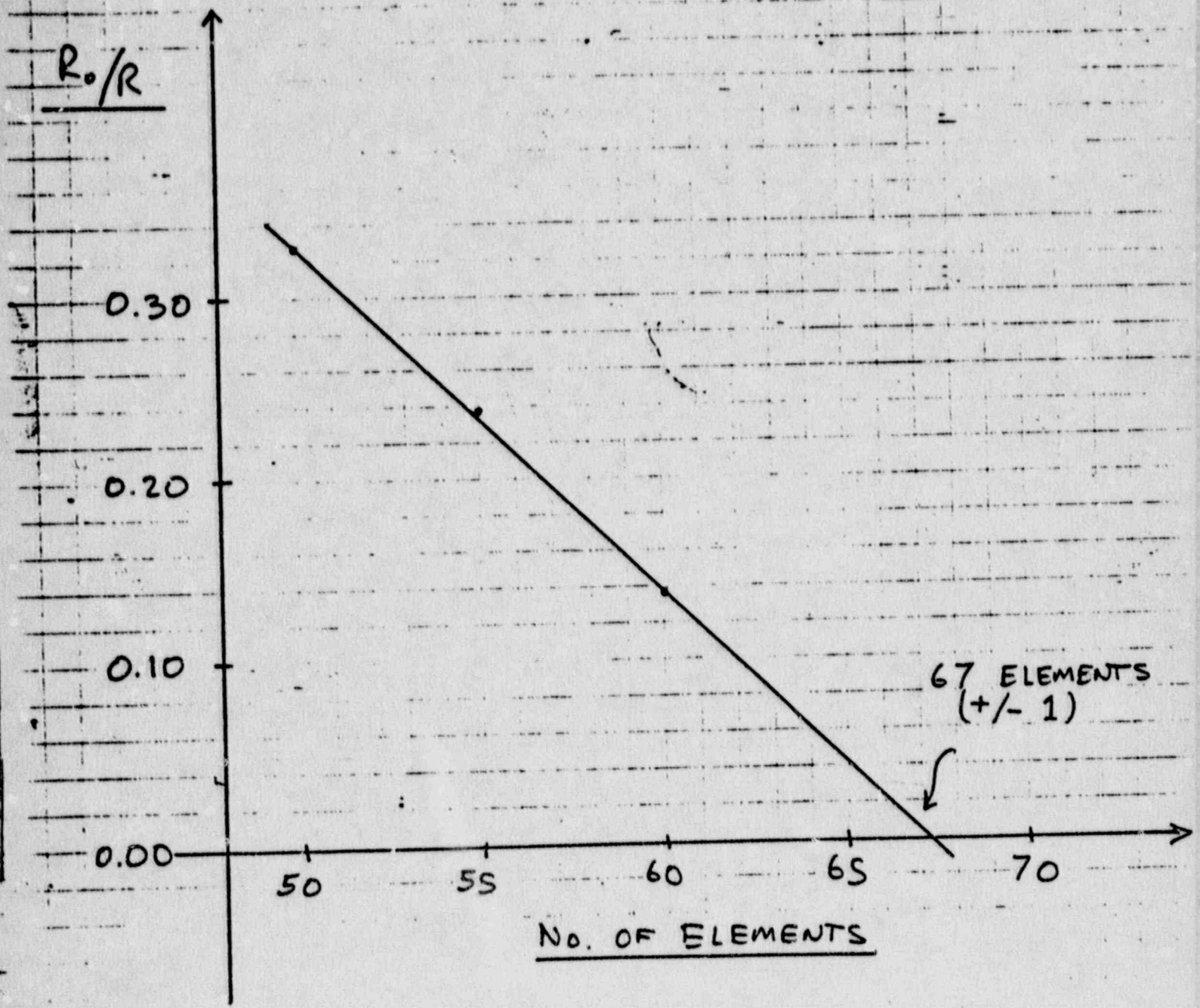
*REFERENCE (based on "K.21", modified for GA)

SOP XI, "Fuel Loading and Unloading" - MARK 1
GA Reactor Operator Training Manual, 6-2 to 6-16

GRAPH PAPER FOR K-20



KEY - QUESTION K-20



*QUESTION K.21 [1.00]

MULTIPLE CHOICE. SELECT THE CORRECT ANSWER.

A reactor control rod reactivity worth calibration is being conducted using the using the "bump period method" in accordance with the MARK-1 Standard Operating Procedures. The REG rod being calibrated has been withdrawn in SIX equal reactivity increments to go from fully inserted to fully withdrawn. After EACH withdrawal the STABLE PERIOD measured [between 5 watts and 1 KW] was +37 seconds. Use the attached curve of Excess Reactivity" Vs. "Reactor Period" if needed.

What is the total worth of this control rod?

a. $10.05

b. $4.64

c. $2.64

d. $1.20

*ANSWER

d.

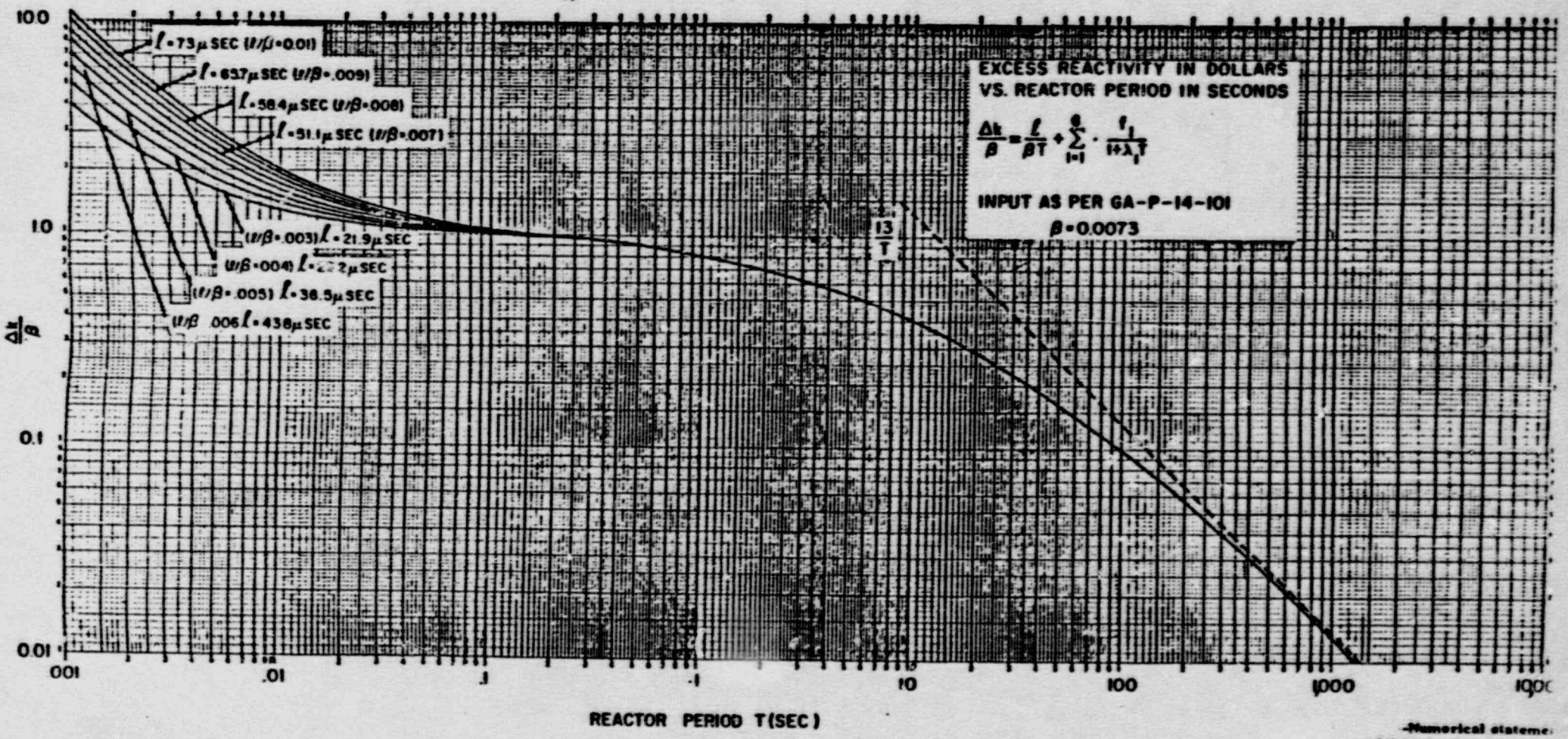
See attached sheet.

*REFERENCE (modified from K.19, GA specific)

SOP IX, MARK 1
MARK 1 Plant Curves
Numerical Statement of the Inhour equation (from GA-P-14-101)

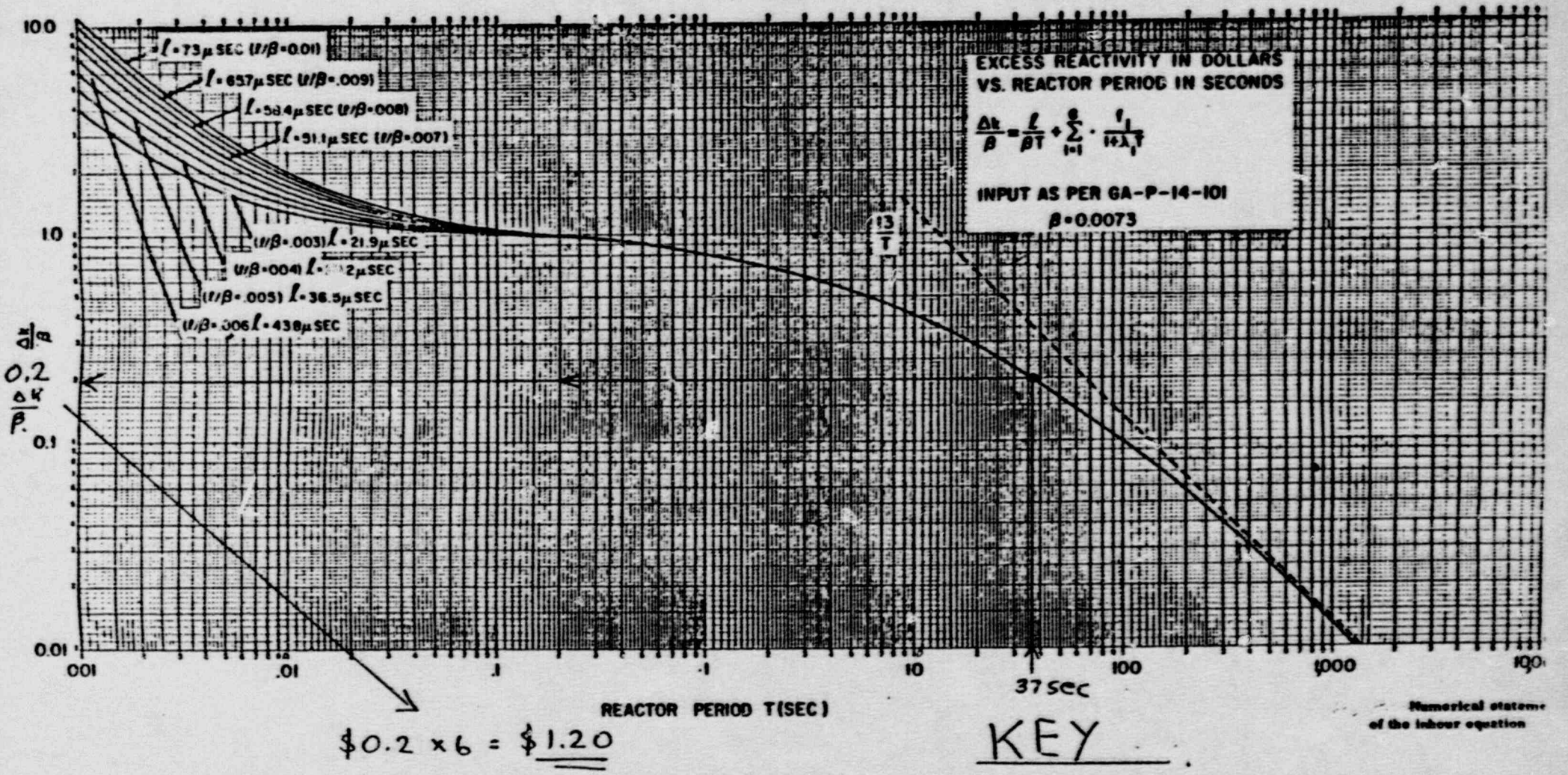
END OF CATEGORY K
GO ON TO CATEGORY L

FIGURE K.21



-Numerical statement of the labour equation

FIGURE K.21 - KEY



CATEGORY L
ADMINISTRATIVE PROCEDURES, PRECAUTIONS AND LIMITATIONS

*QUESTION L.01 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Following a SCRAM the MARK 1 control rods did not drop into the core. Per the Alarm and Scram Procedures, as the Reactor Operator you:

* try the manual scram bar and turn off the magnet power key
* secure console power, and then restore it, and
* try to insert fuel rods by hand and insert spare control rods

What is the one(1) other thing that you can do to shut the reactor down in accordance with the procedures?

a. dump the emergency 50 gallon drums containing soluble Boron in into the reactor pool.

b. remove fuel, starting at the B-ring

c. dump the emergency 50 gallon drums containing soluble Cadmium in into the reactor pool.

d. remove fuel, starting at the D-ring

*ANSWER

b.

*REFERENCE $ (F.02)

SOP VI-7, MK 1

*QUESTION L.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Following a SCRAM the MARK 1 control rods did not drop into the core. Per the Alarm and Scram Procedures, as the Reactor Operator you:

* try the manual scram bar and turn off the magnet power key
* secure console power, and then restore it, and
* try to insert fuel rods by hand and insert spare control rods

Why is it required to restore power to the console?

a. so that the radiation monitors would still work

b. so that fuel temperature could still be monitored

c. so that the conductivity monitors would still work

d. so that the power channels could still be monitored

*ANSWER

d.

*REFERENCE $ (F.03)

SOP VI-7, MK 1

*QUESTION L.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Based on MARK 1 Technical Specifications and Administrative Procedures there are three types of defined "experiment" classifications. Two of these are ROUTINE EXPERIMENTS and MODIFIED ROUTINE EXPERIMENTS.

What is name the other type of experiment classification?

a. Special experiment

b. Classified experiment

c. Irradiation experiment

d. Fissile experiment

*ANSWER

a.

*REFERENCE

GA TECHNICAL SPECIFICATIONS - MK 1, 1.8
Administrative Procedures, pp. 4

*QUESTION L.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Operation of the Torrey Pines TRIGA Reactors Facility is under the jurisdiction of the TRIGA Reactors Division of GA. The "TRIGA Reactors Facility" organization is part of this division.

What is the title of the PRINCIPAL head of the TRIGA Reactors Facility organization?

a. Physicist in Charge

b. President, Enterprises Division

c. Chairman & Chief Executive Officer

d. President, Torrey Pines TRIGA Reactors Division

*ANSWER

a.

*REFERENCE

Administrative Procedures, pp. 4-5

*QUESTION L.05 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Per the TRIGA Reactors Facility Administrative Procedures, the Emergency Response and Recovery Director (ERRD) is charged with evaluating the facility's emergency procedures.

Who is PRINCIPALLY disignated as the ERRD?

a. Chief Security Officer

b. Physicist in Charge

c. Health Physicist

d. Lead Senior Reactor Operator

*ANSWER

b.

*REFERENCE

Administrative Procedures, pp. 14

*QUESTION L.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK 1 Technical Specifications identify the minimum pool level above the top grid plate during reactor operation.

What is this operating limit?

a. 12 feet

b. 14 feet

c. 16 feet

d. 18 feet

*ANSWER

b.

*REFERENCE $ (C.09)

MARK 1 Technical Specifications, 3.0

*QUESTION L.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK F Technical Specifications identify the minimum pool level above the top grid plate during reactor operation.

What is this operating limit?

a. 12 feet

b. 14 feet

c. 16 feet

d. 18 feet

*ANSWER

c.

*REFERENCE $ (C.10)

MARK F Technical Specifications, 4.0

*QUESTION L.08 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Neither the MARK 1 or MARK F Technical Specifications permit reactor operations with a bulk pool temperature above a certain limit.

What is this operating limit for bulk pool temperature?

a. 45 degrees C

b. 55 degrees C

c. 65 degrees C

d. 75 degrees C

*ANSWER

c.

*REFERENCE $ (C.11)

MARK 1 Technical Specifications, 3.0
MARK F Technical Specifications, 4.0

*QUESTION L.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK 1 Technical Specifications limit the reactivity worth for all experiments. For MARK 1 operations:

What is the maximum reactivity worth for any individual experiment?

a. $1.00

b. $2.00

c. $3.00

d. $4.00

*ANSWER

c.

*REFERENCE $ (C.13)

MARK 1 Technical Specifications, 8.2

*QUESTION L.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK 1 Technical Specifications limit the reactivity worth for all combined experiments. For MARK 1 operations:

What is the total absolute reactivity worth for any combination of experiments?

a. $1.00

b. $2.00

c. $3.00

d. $4.00

*ANSWER

d.

*REFERENCE $ (C.14)

MARK 1 Technical Specifications, 8.2

*QUESTION L.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK 1 Technical Specifications state that fueled experiments which are NOT covered elsewhere in the Technical Specifications will be limited so that the total inventory of iodine 131 and 135 in each experiment is restricted.

What is this inventory limit for fueled experiments?

a. 1.5 microcuries of iodine 131 and 135

b. 1.5 curies of iodine 131 and 135

c. 1.5 millirem of iodine 131 and 135

d. 1.5 rem of iodine 131 and 135

*ANSWER

b.

*REFERENCE # (E.15)

MARK 1 Technical Specifications, 8.2.4

*QUESTION L.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

In accordance with the GA Torrey Pines Operating Procedures and the Code of Federal Regulations:

Which of the following situations would require the DIRECT supervision of a licensed SENIOR reactor operator?

a. an unlicensed individual unloading fuel from the core

b. a reactor operator trainee during start-up operation

c. a student who is operating the reactor for training as a part of his/her courses

d. an individual operating the MARK 1 reactor who is licensed at another TRIGA facility

*ANSWER

a.

*REFERENCE $ (F.01)

10CFR55.13
SOP 11, MK 1 & MK F

*QUESTION L.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

TRIGA Facility Radiological Safety requirements specify that only containers made of a certain type of material may be used for fissionable isotopes irradiated during In-Core experiments in the rotary specimen rack.

What type of material must these isotope containers be made of?

a. steel

b. aluminum

c. copper

d. ziconium

*ANSWER

b.

*REFERENCE # (F.07)

Radiological Safety, V-5 to V-6

*QUESTION L.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Considering the radiological safety aspects of in core experiments:

What is the PRINCIPAL atvantage of using plastic sample containers when irradiating specimens?

a. activation of plastic is minimized by the low neutron microscopic cross section of plastic

b. plastic is highly resistive to gamma flux degradation

c. corrosion of plastic is minimized by the low neutron microscopic cross section of plastic

d. plastic is highly resistive to thermal flux degradation

*ANSWER

a.

*REFERENCE $ (F.08)

Radiological Safety, V-5 to V-6

*QUESTION L.15 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

There are two external SCRAM circuits that cannot be automatically tested by the Data Acquisition and Control Unit (DAC) of the MARK 1 reactor. However, these inputs may be tested manually. Per the MARK 1 Operating Procedures:

How is the "King Furnace" SCRAM manually LOCALLY tripped?

a. by quickly removing and then restoring auxiliary breaker power

b. by removing the jumper on the back panel of the auxiliary D.C. power supply

c. by quickly removing and then restoring auxiliary 120 VAC power

d. by removing the jumper on the front panel of the "furnace" power supply

*ANSWER

d.

*REFERENCE $ (F.09)

SOP II, II-11

*QUESTION L.16 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK 1 reactor Technical Specifications limit the maximum operating power level, except for pulsing operations.

What is this maximum operating power level?

a. 250 kilowatts

b. 1500 kilowatts

c. 250 watts

d. 1500 watts

*ANSWER

a.

*REFERENCE $ (F.10)

MARK 1 reactor Technical Specifications, 7.0

#QUESTION L.17 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK F reactor Technical Specifications limit the maximum operating power level, except for pulsing operations.

What is this maximum operating power level?

a. 250 kilowatts

b. 1500 kilowatts

c. 250 watts

d. 1500 watts

#ANSWER

b.

#REFERENCE $ (F.11)

MARK F reactor Technical Specifications, 9.0

*QUESTION L.18 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK F Technical Specifications basically limit "transient operations" via TWO other parameters besides reactor power.

What are these TWO parameters?

a. cladding temperature and transient reactivity added

b. fuel can pressure and fuel temperature added

c. fuel temperature and transient reactivity added

d. fuel can pressure and cladding temperature added

*ANSWER

c.

*REFERENCE $ (F.12)

MARK F reactor Technical Specifications, 9.2

*QUESTION L.19 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The physical security controls for the MARK F reactor are stricter that for the MARK 1 facility. The spaces within the MARK F reactor room must be actively monitored with all intrusion alarms set in the "secure mode" when the area is UNOCCUPIED.

When is the MARK F reactor room considered "OCCUPIED?"

a. when an armed security guard is present in the reactor room

b. when a licensed Reactor Operator or Senior Reactor Operator is at the reactor console

c. when an armed security guard is within a five minute walking distance from the reactor room

d. when the "Senior Physicist in Charge" is in the reactor room

*ANSWER

b.

*REFERENCE $ (F.13)

Administrative Procedures and equirements, III-16

#QUESTION L.20 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Why are the physical security controls for the MARK F reactor stricter that for the MARK 1 facility?

a. much of the fuel cortains uranium enriched above 20 weight percent

b. secret De,artment of Defense experiments involving thermionic testing

c. much of the fuel contains plutonium-239, above 20 weight percent

d. secret Department of Defense experiments involving thermo nuclear testing

#ANSWER

a.

#REFERENCE $ (F.14)

Administrative Procedures and Requirements, III-16

END OF CATEGORY L
END OF EXAM

MASTER

KEY

U.S. NUCLEAR REGULATORY COMMISSION
REACTOR OPERATOR LICENSE EXAMINATION

Facility: Gulf Atomic

Reactor Type: TRIGA [MARK-I & MARK-F]

Date Administered: October 31, 1989

Examiner: Thomas R. Meadows

Candidate: ***KEY***

INSTRUCTIONS TO CANDIDATE

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category. Examination papers will be picked up six (6) hours after the examination starts.

Category Value	% of Total	Candidate's Score	% of Cat. Value	
~~15~~ 17	~~14.5%~~ 17.4			A. Principles of Reactor Operation
~~14~~ 13	~~13.5%~~ 13.3			B. Features of Facility Design
~~15~~ 13	~~14.5%~~ 13.3			C. General Operating Characteristics
~~15.5~~ 14.5	~~15%~~ 14.9			D. Instruments and Controls
~~15~~ 15	~~14.5%~~ 15.4			E. Safety and Emergency Systems
~~15~~ 15	~~14.4%~~ 15.4			F. Standard and Emergency Operating Procedures
~~14~~ 13	~~13.5%~~ 13.3			G. Radiation Control and Safety
~~103.5~~ 97.5	100%			Totals

Final Grade _____%

All work done on this examination is my own. I have neither given nor received aid.

KEY
Candidate's Signature

ES-201
Rev. 5 01/01/89

PROCEDURES FOR THE ADMINISTRATION OF WRITTEN EXAMINATIONS

During the administration of this examination the following rules apply:

1. Cheating on the examination means an automatic denial of your application and could result in more severe penalties.

2. After the examination has been completed, you must sign the statement on the cover sheet indicating that the work is your own and you have not received or given assistance in completing the examination. This must be done after you complete the examination.

3. Restroom trips are to be limited and only one applicant at a time may leave. You must avoid all contacts with anyone outside the examination room to avoid even the appearance or possibility of cheating.

4. Use black ink or dark pencil only to facilitate legible reproductions.

5. Print your name in the blank provided in the upper right-hand corner of the examination cover sheet.

6. Fill in the date on the cover sheet of the examination (if necessary).

7. You may write your answers on the examination question page or on a separate sheet of paper. USE ONLY THE PAPER PROVIDED AND DO NOT WRITE ON THE BACK SIDE OF THE PAGE.

8. If you write your answers on the examination question page and you need more space to answer a specific question, use a separate sheet of the paper provided and insert it directly after the specific question. DO NOT WRITE ON THE BACK SIDE OF THE EXAMINATION QUESTION PAGE.

9. Print your name in the upper right hand corner of the first page of each section of your answer sheets whether you use the examination question pages or separate sheets of paper. Initial each page.

10. Before you turn in your examination, consecutively number each answer sheet, including any additional pages inserted when writing your answers on the examination question page.

11. If you are using separate sheets, number each answer as to category and number (i.e. 1.04, 6.10) and skip at least 3 lines between answers to allow space for grading.

12. Write "End of Category " at the end of your answers to a category.

13. Start each category on a new page.

14. Write "Last Page" on the last answer sheet.

15. Use abbreviations only if they are commonly used in facility literature. Avoid using symbols such as < or > signs to avoid a simple transposition error resulting in an incorrect answer. Write it out.

16. The point value for each question is indicated in parentheses after the question. The amount of blank space on an examination question page is NOT an indication of the depth of answer required.

17. Show all calculations, methods, or assumptions used to obtain an answer.

18. Partial credit may be given. Therefore, ANSWER ALL PARTS OF THE QUESTION AND DO NOT LEAVE ANY ANSWER BLANK. Partial credit will not be given on multiple choice questions.

19. Proportional grading will be applied. Any additional wrong information that is provided may count against you. For example, if a question is worth one point and asks for four responses, each of which is worth 0.25 points, and you give five responses, each of your responses will be worth 0.20 points. If one of your five responses is incorrect, 0.20 will be deducted and your total credit for that question will be 0.80 instead of 1.00 even though you got the four correct answers.

20. If the intent of a question is unclear, ask questions of the examiner only.

21. When turning in your examination, assemble the completed examination with examination questions, examination aids and answer sheets. In addition, turn in all scrap paper.

22. To pass the examination, you must achieve an overall grade of 80% or greater and at least 70% in each category.

23. There is a time limit of (6) hours for completion of the examination (or some other time if less than the full examination is taken).

24. When you are done and have turned in your examination, leave the examination area (DEFINE THE AREA). If you are found in this area while the examination is still in progress, your license may be denied or revoked.

25. Ensure that all information you wish to have evaluated as part of your answer is on your answer sheet, scrap paper will be disposed of without review immediately following the examination.

EQUATION SHEET

$f = ma$

$w = mg$

$E = mC^2$

$KE = \frac{1}{2}mv^2$

$PE = mgh$

$W = v\Delta P$

$\Delta E = 931\Delta m$

$\dot{Q} = \dot{m}C_p\Delta T$

$\dot{Q} = UA\Delta T$

$Pwr = W_f \dot{m}$

$P = P_o\ 10^{SUR(t)}$

$P = P_o\ e^{t/T}$

$SUR = 26.06/T$

$T = 1.44\ DT$

$SUR = 26\left(\frac{\lambda_{eff}\rho}{\bar{\beta} - \rho}\right)$

$T = (\ell^*/\rho) + [(\bar{\beta} - \rho)/\lambda_{eff}\rho]$

$T = \ell^*/(\rho - \bar{\beta})$

$T = (\bar{\beta} - \rho)/\lambda_{eff}\rho$

$\rho = (K_{eff} - 1)/K_{eff} = \Delta K_{eff}/K_{eff}$

$\rho = [\ell^*/TK_{eff}] + [\bar{\beta}/(1 + \lambda_{eff}T)]$

$P = \Sigma\phi V/(3 \times 10^{10})$

$\Sigma = N\sigma$

$v = s/t$

$s = v_o t + \frac{1}{2}at^2$

$a = (v_f - v_o)/t$

$v_f = v_o + at$

$\omega = \theta/t$

Cycle efficiency = $\frac{\text{Net Work (out)}}{\text{Energy (in)}}$

$A = \lambda N \qquad A = A_o e^{-\lambda t}$

$\lambda = \ln 2/t_{\frac{1}{2}} = 0.693/t_{\frac{1}{2}}$

$t_{\frac{1}{2}}(eff) = \frac{(t_a)(t_b)}{(t_a + t_b)}$

$I = I_o e^{-\Sigma x}$

$I = I_o e^{-\mu x}$

$I = I_o\ 10^{-x/TVL}$

$TVL = 1.3/\mu$

$HVL = 0.693/\mu$

$SCR = S/(1 - K_{eff})$

$CR_x = S/(1 - K_{effx})$

$CR_1(1 - K_{eff})_1 = CR_2(1 - K_{eff})_2$

$M = 1/(1 - K_{eff}) = CR_1/CR_0$

$M = (1 - K_{eff})_0/(1 - K_{eff})_1$

$SDM = (1 - K_{eff})/K_{eff}$

$\ell^* = 1 \times 10^{-5}$ seconds

$\lambda_{eff} = 0.1$ seconds^{-1}

$I_1 d_1 = I_2 d_2$

$I_1 d_1^2 = I_2 d_2^2$

$R/hr = (0.5\ CE)/d^2$ (meters)

$R/hr = 6CE/d^2$ (feet)

WATER PARAMETERS

1 gal. = 8.345 lbm

1 gal. = 3.78 liters

1 ft^3 = 7.48 gal.

Density = 62.4 lbm/ft^3

Density = 1 gm/cm^3

Heat of vaporization = 970 Btu/lbm

Heat of fusion = 144 Btu/lbm

1 Atm = 14.7 psi = 29.9 in. Hg

1 ft. H_2O = 0.4335 lbf/in^2

MISCELLANEOUS CONVERSIONS

1 Curie = 3.7×10^{10} dps

1 kg = 2.21 lbm

1 hp = 2.54×10^3 BTU/hr

1 Mw = 3.41×10^6 Btu/hr

1 Btu = 778 ft-lbf

1 inch = 2.54 cm

$^\circ F = 9/5\,^\circ C + 32$

$^\circ C = 5/9\ (^\circ F - 32)$

CATEGORY A
PRINCIPLES OF REACTOR OPERATION

*QUESTION A.01 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For General Atomic's, Torrey Pines MARK 1 reactor:

Which one of the following represents the PRINCIPAL REFLECTOR used?

a. water

b. zirconium

c. aluminum

d. graphite

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pg. 1-16
GA Reactor Operator Training Manual, pg. 6-7

*QUESTION A.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For General Atomic's, Torrey Pines MARK F reactor:

Which one of the following represents the PRINCIPAL REFLECTOR used?

a. water

b. zirconium

c. aluminum

d. graphite

*ANSWER

a.

*REFERENCE $

GA Reactor Operator Training Manual, pg. 1-16
GA Reactor Operator Training Manual, pg. 6-7

*QUESTION A.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For General Atomic's Torrey Pines MARK F or MARK I reactors, the addition of a reflector has a specific effect on NEUTRON FLUX:

Which one of the following statements correctly describes this effect?

a. With a reflector in place thermal flux is lower at the edge of the core.

b. With a reflector in place fast flux is higher at the edge of the core.

c. With a reflector in place fast flux is lower at the edge of the core.

d. With a reflector in place thermal flux is higher at the edge of the core.

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pg. 1-16
GA Reactor Operator Training Manual, pg. 6-7

*QUESTION A.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which one of the following statements correctly describes the property of a GOOD MODERATOR?

a. It slows down fast neutrons to thermal energy levels via a large number of collisions.

b. It slows down fast neutrons to thermal energy levels via a small number of collisions.

c. It slows down prompt neutrons to thermal energy levels via a small number of collisions.

d. It slows down prompt neutrons to thermal energy levels via a large number of collisions.

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pg. 6-6

#QUESTION A.05 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK I reactor is at a power of 1 watt, with a 30 second stable period.

How long will it take for power to reach 500 watts?

a. 186 seconds

b. 140 seconds

c. 124 seconds

d. 81 seconds

#ANSWER

a.

$n/n_o = \exp[t/T]$

$500 = \exp[t/T]$

$\ln 500 = t/30$

$t = 6.21 \times 30 = 186$ seconds

#REFERENCE #

GA Reactor Operator Training Manual, pg. 6-13

*QUESTION A.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK I reactor is at a power of 0.1 watt. 25 cents of reactivity is inserted. Assuming, Lamda-eff = 0.08 and Beff = 0.007:

What is the resulting stable reactor period?

a. 48 seconds

b. 36 seconds

c. 28 seconds

d. 22 seconds

*ANSWER

b.

deltaK/K = .25 x .007 = .0018

T = L + ////// [Beff - deltaK/K] / Lamda-eff x deltaK/K

T = [0.007 - 0.0018]/[0.0018 x 0.08] "L" can be neglected

T = 0.0052/[0.0018 x 0.08]

T = 36 seconds

*REFERENCE $

GA Reactor Operator Training Manual, pg. 6-15

*QUESTION A.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK F reactor was shutdown after an extended high power run.

How long will it take for the MAXIMUM xenon POISON effect to occur?

a. 20 to 40 hours

b. 5 to 7 hours

c. 1 to 3 hours

d. Immediately

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pg. 6-25

*QUESTION A.08 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

How is PEAK POWER related to REACTIVITY during a pulse?

a. Peak power will vary linearly with the prompt excess reactivity.

b. Peak power will vary as the square of the excess reactivity.

c. Peak power will vary as the square of the prompt excess reactivity.

d. Peak power will vary linearly with the excess reactivity.

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, pg. 6-33 through 6-46

*QUESTION A.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The Mark F reactor is subcritical with a Keff of 0.96 and 30 counts per second indicated. After a fuel element is removed the count rate drops to 10 counts per second. No other changes have occurred.

What is the Keff of the core with the fuel element removed?

a. 0.9733

b. 0.8800

c. 0.8400

d. 0.6666

*ANSWER

b.

CR1/CR2 = [1 - Keff2] / [1 - Keff1]

30/10 = [1 - Keff] / [1 - 0.96]

1 - Keff = 3 x 0.04 = 0.12

Keff = 0.8800

*REFERENCE $

GA Reactor Operator Training Manual, pg. 6-16

*QUESTION A.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The core reactivity is affected if a void, such as an empty speciman container filled with air, is inserted.

What is the reactivity effect for a 1% water void in the MARK-I reactor:

a. NEGATIVE reactivity of about 10-6 delta-K/K.

b. NEGATIVE reactivity of about 10-3 delta-K/K.

c. POSITIVE reactivity of about 10-6 delta-K/K.

d. POSITIVE reactivity of about 10-3 delta-K/K.

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pg. 6-23 & Appendix B

*QUESTION A.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The core reactivity is affected if a void, such as an empty speciman container filled with air, is inserted.

What is the reactivity effect for a 1% water void in the MARK-F reactor:

a. NEGATIVE reactivity of about 10-6 % delta-K/K.

b. NEGATIVE reactivity of about 10-3 % delta-K/K.

c. POSITIVE reactivity of about 10-6 % delta-K/K.

d. POSITIVE reactivity of about 10-3 % delta-K/K.

*ANSWER

a.

DELETED

*REFERENCE $

GA Reactor Operator Training Manual, pg. 6-23 & Appendix B

*QUESTION .12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which one of the following most closly approximates "Reactor Period?"

a. The time in seconds for the neutron population to increase by a factor of nearly 1.333.

b. The time in seconds for the neutron population to increase by a factor of nearly 1.718.

c. The time in seconds for the neutron population to increase by a factor of nearly 2.333.

d. The time in seconds for the neutron population to increase by a factor of nearly 2.718.

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pg. 6-9 through 6-16

*QUESTION A.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

When referring to the reactivity of the MARK 1 reactor core:

Which one of the following statements corectly explains the equivalence of net dollar of reactivity?

a. One dollar [$1.00] is equivalent to Beff = 0.0073 delta-K/K.

b. One dollar [$1.00] is equivalent to Keff = 1.00 delta-K/K.

c. One dollar [$1.00] is equivalent to Beff = 1.00 delta-K/K.

d. One dollar [$1.00] is equivalent to Keff = 0.0073 delta-K/K.

*ANSWER

a.

*REFERENCE #

GA Reactor Operator Training Manual, pg. 6-9 through 6-16

*QUESTION A.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

TRIGA reactors are not permitted to be pulsed from power levels above 1kW.

Which one of the following statements correctly describes the reason for this requirement?

a. The additional fast neutron flux from the pulse could dangerously embrittle fuel cladding.

b. The additional heat from the pulse could cause pool temperature limits to exceed operating specifications.

c. The additional thermal neutron flux from the pulse could dangerously embrittle fuel cladding.

d. The additional heat from the pulse could cause fuel temperature limits to exceed operating specifications.

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pg. 6-31 through 6-63

*QUESTION A.15 [..0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The basic parameter which permits the MARK I reactor system to operate safely during either steady-state or pulsing conditions is the prompt negative temperature coefficient.

Which of the following effects is the PRIMARY contributor to this design characteristic under these conditions?

a. doppler effects

b. core leakage

c. core spectrum-hardening

d. core voiding

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, pg. 6-52 / C-22

END OF CATEGORY A
GO ON TO CATAGORY B

CATEGORY B
FEATURES OF FACILITY DESIGN

*QUESTION B.01 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The reactor pits of both the MARK I and MARK F reactors are similar in that they are made primarily of concrete, encompassing a cylindrical tank.

What is the material composition of the MARK I reactor pit cylindrical tank?

a. iron

b. steel

c. aluminum

d. zirconium

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-5 through 1-6

*QUESTION B.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The reactor pits of both the MARK I and MARK F reactors are similar in that they are made primarily of concrete, encompassing a cylindrical tank.

What is the material composition of the MARK F reactor pit cylindrical tank?

a. iron

b. steel

c. aluminum

d. zirconium

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-5 through 1-6

*QUESTION B.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Primary cooling water provides a vertical radiation shield for both the MARK I and MARK F reactor designs.

How many feet of vertical shield water is normally provided by the MARK I reactor design?

a. 12 feet

b. 16 feet

c. 20 feet

d. 24 feet

*ANSWER

b.

*REFERENCE #

GA Reactor Operator Training Manual, pp. 1-5 through 1-6

*QUESTION B.04 [1.0]

MULTIPLE CHOICE. SELECT THE CORRECT ANSWER

Primary cooling water provides a vertical radiation shield for both the MARK I and MARK F reactor designs.

How many feet of vertical shield water is normally provided by the MARK F reactor design?

a. 12 feet

b. 16 feet

c. 20 feet

d. 24 feet

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-5 through 1-6

*QUESTION B.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the PRIMARY cooling water mode of both the MARK I and MARK F reactors?

a. radiation

b. forced convection

c. natural conduction

d. natural convection

*ANSWER

d.

*REFERENCE $

GA Reactor Operator [illegible] Manual, [illegible]

*QUESTION B.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Based on GA TECHNICAL SPECIFICATIONS for the MARK I reactor:

What is the the maximum temperature limit for the standard HIGH hydride fuel elements in the MARK I core?

a. 1500 degrees C

b. 1030 degrees C

c. 800 degrees C

d. 530 degrees C

*ANSWER

c.

*REFERENCE $

GA TECHNICAL SPECIFICATIONS, 7.4

*QUESTION B.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Based on GA TECHNICAL SPECIFICATIONS for the MARK I reactor:

What is the maximum temperature limit for the standard LOW hydride fuel elements in the MARK I core?

a. 1500 degrees C

b. 1030 degrees C

c. 800 degrees C

d. 530 degrees C

*ANSWER

d.

*REFERENCE $

GA TECHNICAL SPECIFICATIONS, 7.4

*QUESTION B.08 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Based on GA TECHNICAL SPECIFICATIONS for the MARK F reactor:

When is the reactor considered to be "shutdown?"

a. When sufficient control rods are inserted to assure the reactor subcritical by at least $1.00.

b. When the highest worth rod is withdrawn and the shutdown margin remains less than $0.50.

c. When sufficient control rods are inserted to assure the reactor subcritical by at least $0.50.

d. When the highest worth rod is withdrawn and the shutdown margin remains less than $1.00.

*ANSWER

a.

*REFERENCE $

GA TECHNICAL SPECIFICATIONS - MK F, 1.0

*QUESTION B.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the material composition of the MARK I's LOW-hydride fuel cladding?

a. stainless steel

b. zirconium

c. aluminum

d. hafnium alloy

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-12

*QUESTION B.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the material composition of the MARK F's HIGH-hydride fuel cladding?

a. stainless steel

b. zirconium

c. aluminum

d. hafnium alloy

*ANSWER

a.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-12

*QUESTION B.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the material composition of the MARK F's standard FLIP unirradiated fuel?

a. Maximum uranium content of 9.0 wt.% with a maximum enrichment of 20%.

b. Maximum plutonium content of 9.0 wt.% with a nominal addition of 70% Pu-239.

c. Maximum uranium content of 9.0 wt.% with a nominal enrichment of 70%.

d. Maximum plutonium content of 9.0 wt.% with a maximum addition of 20% Pu-239.

*ANSWER

c.

*REFERENCE $

GA TECHNICAL SPECIFICATIONS - MK F

*QUESTION B.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the material composition of the MARK I's standard unirradiated fuel?

a. Maximum uranium content of 9.0 wt.% with a maximum enrichment of 20%.

b. Maximum plutonium content of 9.0 wt.% with a nominal addition of 70% Pu-239.

c. Maximum urainium content of 9.0 wt.% with a nominal enrichment of 70%.

d. Maximum plutonium content of 9.0 wt.% with a maximum addition of 20% Pu-239.

*ANSWER

a.

*REFERENCE $

GA TECHNICAL SPECIFICATIONS - MK I

*QUESTION B.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the material composition of the MARK F's standard control rod or transient rod?

a. graphite impregnated with boron

b. compacted and sintered boron carbide

c. boron carbide mixed with ziconium hydride

d. boron carbide mixed with aluminum oxide

*ANSWER

a.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-22 through 1-23

*QUESTION B.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the material composition of the MARK I's standard control rod or transient rod?

a. graphite impregnated with boron

b. compacted and sintered boron carbide

c. boron carbide mixed with ziconium hydride

d. boron carbide mixed with aluminum oxide

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-22 through 1-23

END OF CATEGORY B
GO ON TO CATEGORY C

CATEGORY C
GENERAL OPERATING CHARACTERISTICS

*QUESTION C.01 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

If the reactivity and the temperature changes in the same direction, the bath coefficient is "positive." If the reactivity and the temperature changes in the opposite direction, the bath coefficient is "negative."

Which of the following correctly describe the characteristics of the bath coefficient in the low-hydride and high-hydride standard fuel?

a. The bath coefficient is SMALL but positive in the room temperature region, becoming negative at higher temperatures.

b. The bath coefficient is negative at all temperatures, but INCREASES in magnitude over the entire operating temperature range.

c. The bath coefficient is LARGE but negative in the room temperature region, becoming positive at higher temperatures.

d. The bath coefficient is positive at all temperatures, but DECREASES in magnitude over the entire operating temperature range.

*ANSWER

a

*REFERENCE $

GA Reactor Operator Training Manual, pp. VI-21 to VI-22

*QUESTION C.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

If the reactivity and the temperature changes in the same direction, the bath coefficient is "positive." If the reactivity and the temperature changes in the opposite direction, the bath coefficient is "negative."

Which of the following correctly describe the characteristics of the bath coefficient in standard FLIP fuel?

a. The bath coefficient is SMALL but positive in the room temperature region, becoming negative at higher temperatures.

b. The bath coefficient is negative at all temperatures, but INCREASES in magnitude over the entire operating temperature range.

c. The bath coefficient is LARGE but negative in the room temperature region, becoming positive at higher temperatures.

d. The bath coefficient is positive at all temperatures, but DECREASES in magnitude over the entire operating temperature range.

*ANSWER

b.

DELETED

*REFERENCE $

GA Reactor Operator Training Manual, pp. VI-21 to VI-22

*QUESTION C.05 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The operating characteristics of both the MARK 1 and MARK F reactor systems cause the reactor response to be much more linear than exponential in their response to reactivity changes.

What is the reason for this behavior?

a. the short delay time for transferring heat to the cooling water coupled with the large prompt negative temperature coefficient.

b. the short delay time for transferring heat to the cooling water coupled with the large prompt positive temperature coefficient.

c. the long delay time for transferring heat to the cooling water coupled with the large prompt positive temperature coefficient.

d. the long delay time for transferring heat to the cooling water coupled with the large prompt negative temperature coefficient.

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pp. VI-22

*QUESTION C.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For the MARK 1 reactor:

What is the approximate value of the reactivity loss due to equilibrium XENON at 200 KW steady state power?

a. 1 x 10-2 delta K/K

b. 1 x 10-3 delta K/K

c. 1 x 10-4 delta K/K

d. 1 x 10-5 delta K/K

*ANSWER

a.

*REFERENCE $

GA Reactor Operator Training Manual, pp. VI-26 to VI-28

*QUESTION C.05 [1.0]

MULTIPLE CHOICE. SELECT THE CORRECT ANSWER

For the MARK 1 reactor, after a startup from a stable shutdown condition to 200 kw steady state power, approximately:.

How long does it take for Xenon to reach equilibrium concentration for this power level?

a. 10 to 20 hours

b. 30 to 40 hours

c. 60 to 70 hours

d. 80 to 90 hours

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, pp. VI-28

*QUESTION C.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For the MARK 1 reactor:

What is the worth of a standard control rod?

a. $1.50

b. $2.00

c. $3.00

d. $5.50

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-23
GA Reactor Operator Training Manual, APPENDIX B

#QUESTION C.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For the MARK 1 reactor:

What is the worth of a transient control rod?

a. $1.50

b. $2.00

c. $3.00

d. $5.50

#ANSWER

c.

#REFERENCE $

GA Reactor Operator Training Manual, pp. 1-23
GA Reactor Operator Training Manual, APPENDIX B

*QUESTION C.08 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

For the MARK F reactor:

What is the worth of a transient control rod?

a. $1.50

b. $2.00

c. $3.00

d. $5.50

*ANSWER

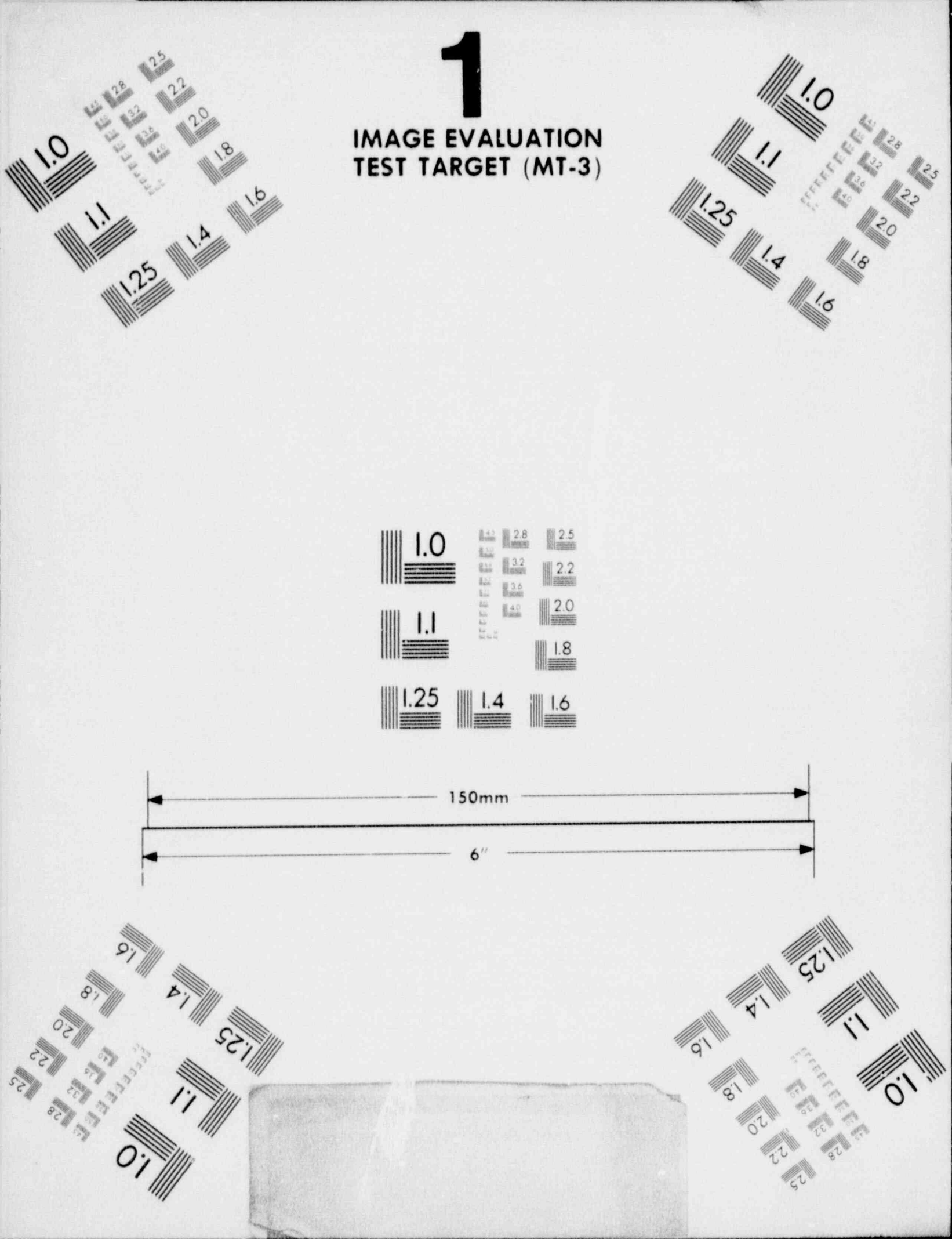
d.

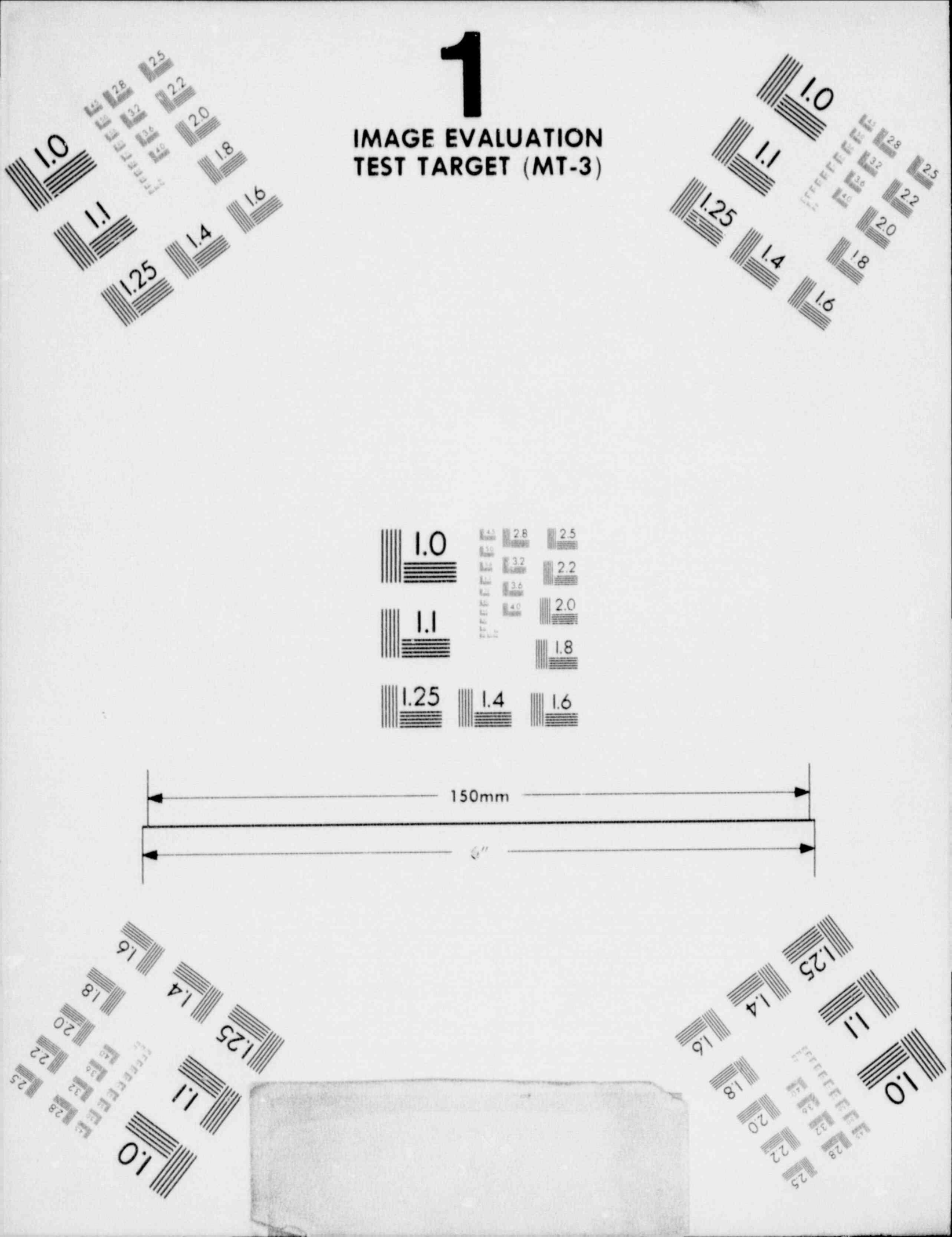
* DELETED 10-31-89
DURING EXAM
BY
CHIEF EXAMINER

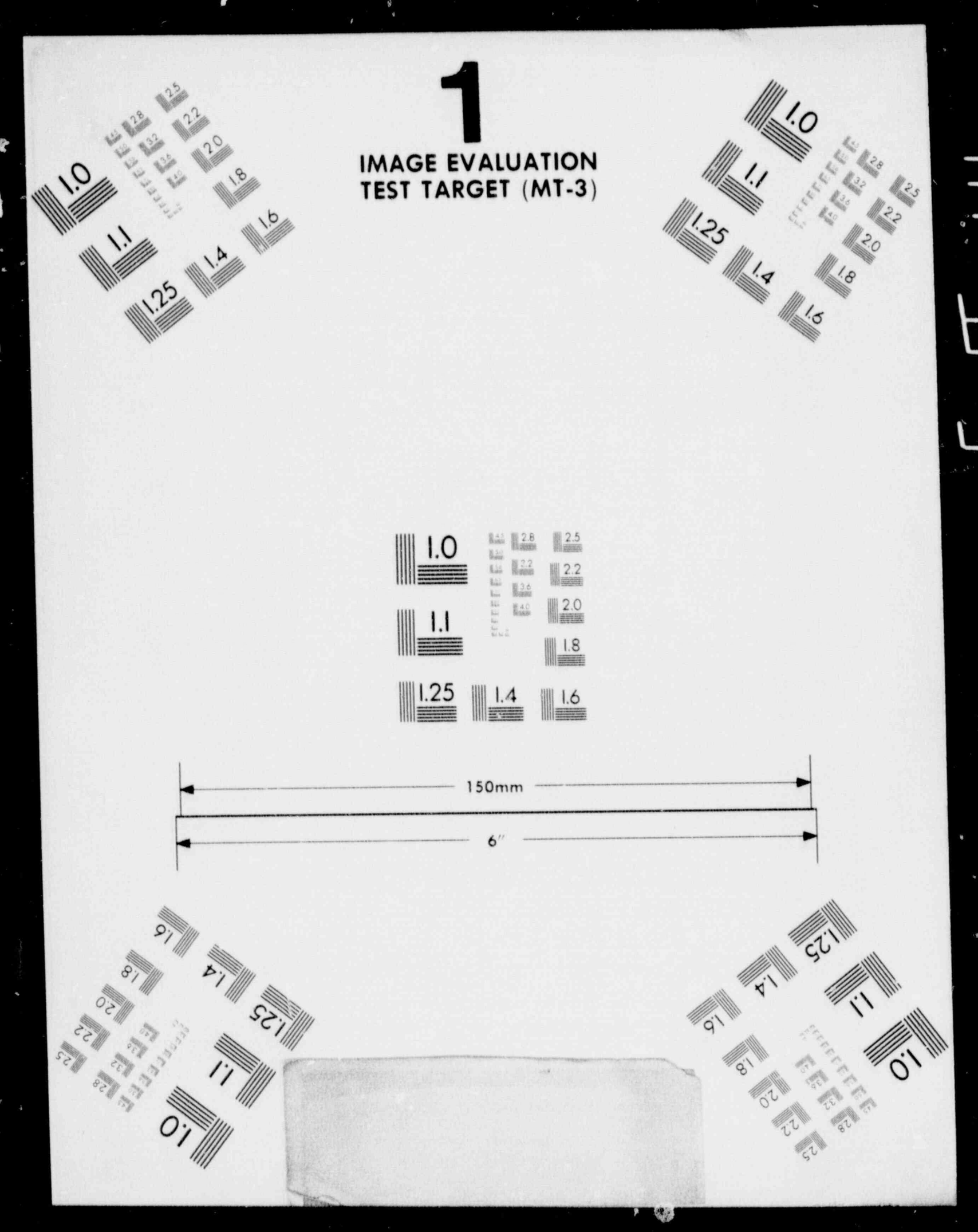
*REFERENCE $

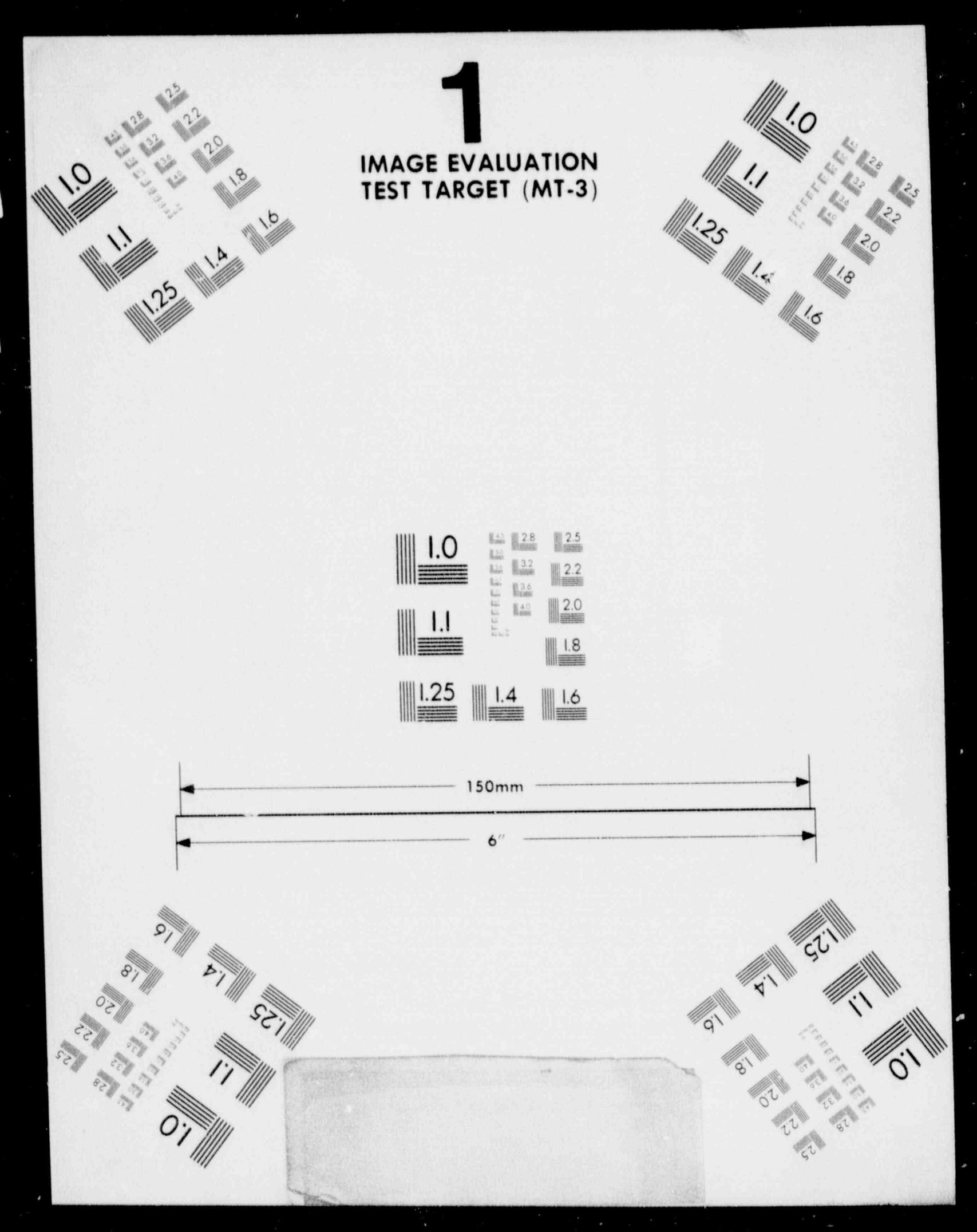
GA Reactor Operator Training Manual, pp. 1-23
GA Reactor Operator Training Manual, APPENDIX B

* Transient rod removed from Core


1
IMAGE EVALUATION
TEST TARGET (MT-3)
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
150mm
6"


1
IMAGE EVALUATION
TEST TARGET (MT-3)
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
150mm
6"


1
IMAGE EVALUATION
TEST TARGET (MT-3)
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
150mm
6"


1
IMAGE EVALUATION
TEST TARGET (MT-3)
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
150mm
6"

*QUESTION C.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK 1 Technical Specifications identify the minimum pool level above the top grid plate during reactor operation.

What is this operating limit?

a. 12 feet

b. 14 feet

c. 16 feet

d. 18 feet

*ANSWER

b.

*REFERENCE $

MARK 1 Technical Specifications, 3.0

*QUESTION C.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK F Technical Specifications identify the minimum pool level above the top grid plate during reactor operation.

What is this operating limit?

a. 12 feet

b. 14 feet

c. 16 feet

d. 18 feet

*ANSWER

c.

*REFERENCE $

MARK F Technical Specifications, 4.0

*QUESTION C.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Neither the MARK 1 or MARK F Technical Specifications permit reactor operations with a bulk pool temperature above a certain limit.

What is this operating limit for bulk pool temperature?

a. 45 degrees C

b. 55 degrees C

c. 65 degrees C

d. 75 degrees C

*ANSWER

c.

*REFERENCE $

MARK 1 Technical Specifications, 3.0
MARK F Technical Specifications, 4.0

*QUESTION C.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

There is a reliable "rule of thumb" correlating reactivity insertion and increasing power on the MARK 1 reactor.

What is this "rule of thumb?"

a. one cent per kilowatt

b. one % delta-K/K per kilowatt

c. one cent per watt

d. one % delta-K/K per watt

*ANSWER

a.

*REFERENCE $

TRIGA TRAINING PROGRAM QUESTIONS

*QUESTION C.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK 1 Technical Specifications limit the reactivity worth for all experiments. For MARK 1 operations:

What is the maximum reactivity worth for any individual experiment?

a. $1.00

b. $2.00

c. $3.00

d. $4.00

*ANSWER

c.

*REFERENCE $

MARK 1 Technical Specifications, 8.2

*QUESTION C.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK 1 Technical Specifications limit the reactivity worth for all combined experiments. For MARK 1 operations:

What is the total absolute reactivity worth for any combination of experiments?

a. $1.00

b. $2.00

c. $3.00

d. $4.00

*ANSWER

d.

*REFERENCE $

MARK 1 Technical Specifications, 8.2

*QUESTION C.15 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Common fuel element inspection tools are used to measure TWO specific fuel element parameters.

What are these TWO parameters?

a. bulging and elongation

b. bowing and elongation

c. bulging and out of roundness

d. bowing and out of roundness

*ANSWER

b.

*REFERENCE *

GA Reactor Operator Training Manual, pp. 1-45 to 1-50

END OF CATEGORY C
GO ON TO CATEGORY D

CATEGORY D
INSTRUMENTS AND CONTROLS

*QUESTION D.01 [2.5]

SHORT ANSWER

The standard control rod drive, illustrated on the attached FIGURE D-1, is basically the same for both the MARK 1 and MARK F reactors.

a. What is the name of the component labled "A" on FIGURE D-1? [0.5]

b. What is the name of the component labled "B" on FIGURE D-1? [0.5]

c. What is the name of the component labled "C" on FIGURE D-1? [0.5]

d. What is the name of the component labled "D" on FIGURE D-1? [0.5]

e. What is the name of the component labled "E" on FIGURE D-1? [0.5]

*ANSWER

[0.5 each]

a. pull rod

b. motor cover [or motor]

c. potentiometer cover [or potentiometer]

d. push rod

e magnet

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-25

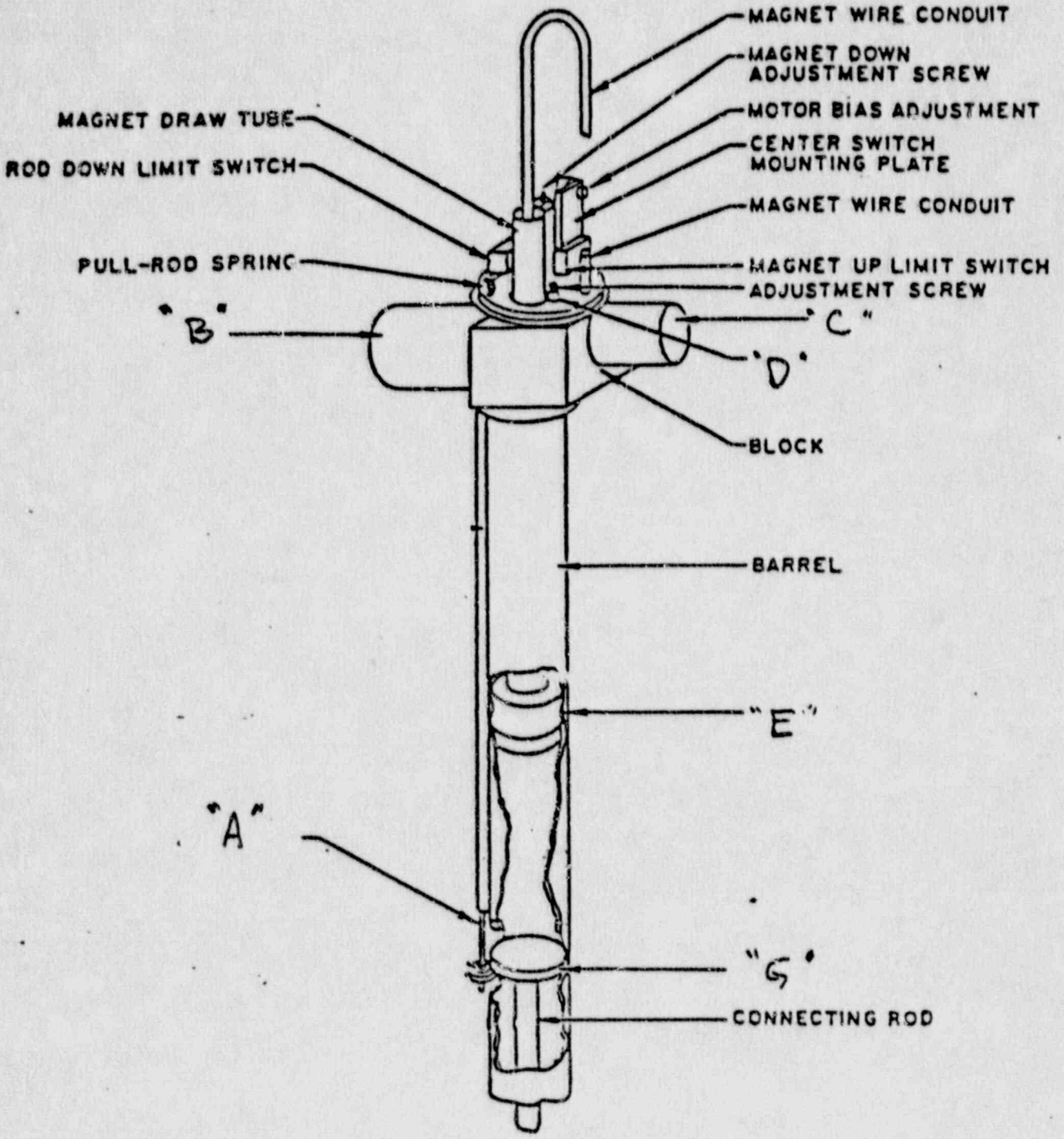


Fig. D-1 -Rod drive mechanism, showing components and adjustment locations

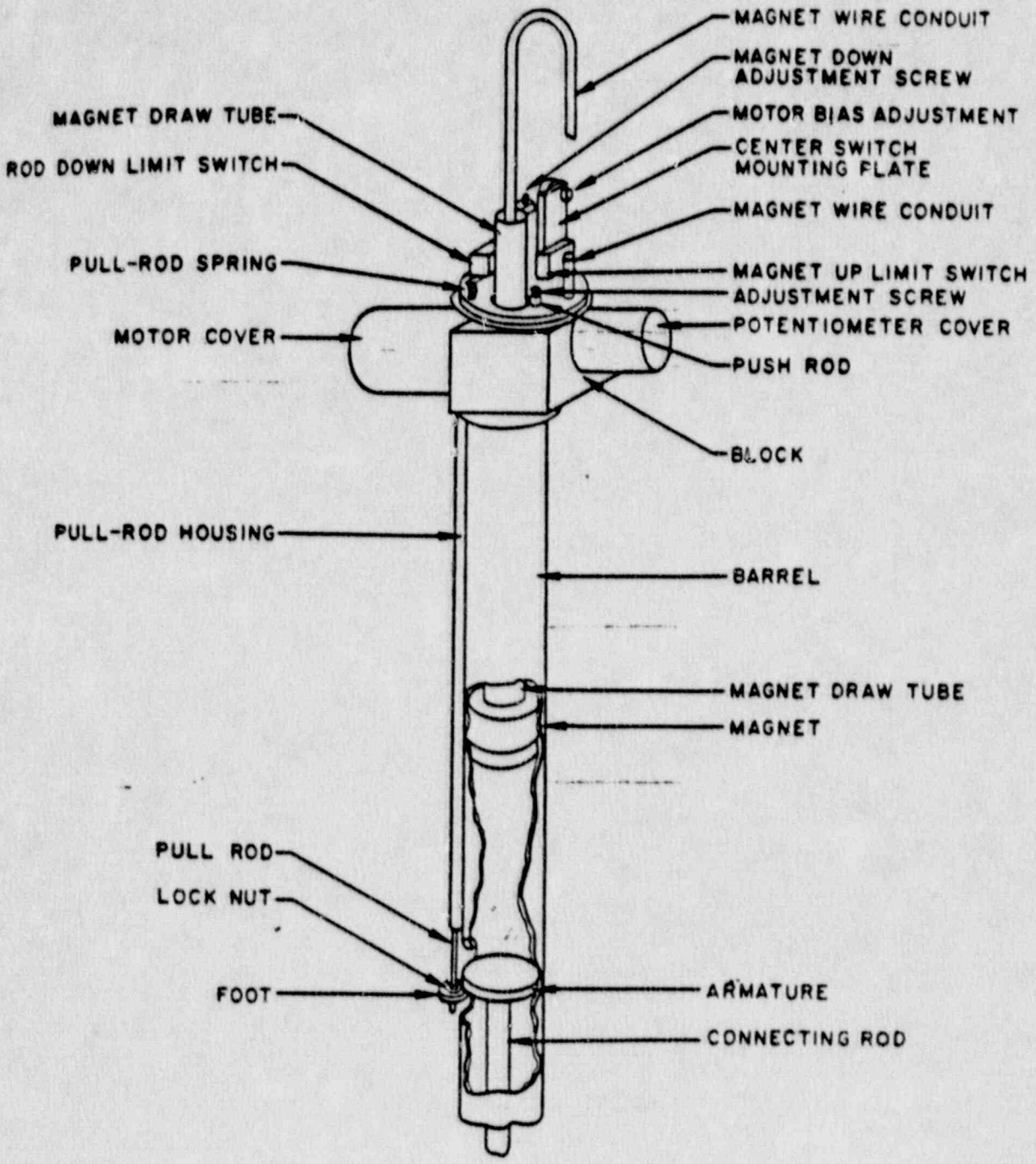


Fig. D-1 Rod drive mechanism, showing components and adjustment locations

KEY

*QUESTION D.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the withdraw time for the standard SHIM and SAFETY rods?

a. 25 seconds

b. 35 seconds

c. 45 seconds

d. 55 seconds

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION D.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the withdraw time for the standard REG rod?

a. 25 seconds

b. 35 seconds

c. 45 seconds

d. 55 seconds

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION D.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the maximum length of travel for the MARK 1 control rods?

a. 15-1/4-inches for all rods, except the transient rod which can move 30 inches.

b. 15-1/4-inches for all rods, including transient rod.

c. 18-inches for all rods, except the transient rod which can only move 30 inches.

d. 18-inches for all rods, including transient rod.

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION D.05 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

How is the electrical position indication developed for the standard SHIM and REG control rod drives?

a. a magnetic pickup counts the number of revolutions of the drive motor, which are summed to give position indication.

b. a tachometer, set-up as an integrator, is connected to the drive motor, which raises and lowers the rod.

c. a 10-turn potentiometer, driven by a separate two-phase motor, provides position indication.

d. a helipot is connected to the pinion gear, which raises and lowers the rod.

*ANSWER

c.

DELETED

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION D.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the length of the "follower" sections of a standard MARK-F control rods?

a. 15-1/4 inches for an aluminum follower and 18 inches for a poison follower.

b. 15-1/4 inches for both the aluminum and poison followers.

c. 18 inches for an aluminum follower and 15-1/4 inches for a poison follower.

d. 18 inches for both the aluminum and poison followers.

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION D.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the reason for adding a follower extension to a standard MARK-F control rod?

a. to only increase the rod worth of the standard rod

b. to change the rod worth as desired by varying the type of material used in the follower extention

c. to only decrease the rod worth of the standard rod

d. to add additional structural support to the control rod during thermionic testing

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION D.08 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the function of a "flux trap" type of follower on a standard MARK-F control rod?

a. to only increase the rod worth of the standard rod

b. to change the rod worth as desired by varying the type of material used in the follower extention

c. to only decrease the rod worth of the standard rod

d. to add additional structural support to the control rod during thermionic testing

*ANSWER

a.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-23

*QUESTION D.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The motor drives for the MARK-1 and MARK-F reactor control rods are essentially the same except that the dashpot device has been modified for the MARK-F.

What is the purpose of the dashpot device?

a. To facilitate the speed adjustment of the transient rod drive for some experiments.

b. To reduce the impact stress effects on the transient control rod after a pulse.

c. To facilitate the speed adjustment of the rod drive motors for some experiments.

d. To reduce the bottoming impact stress effects on the control rod after a reactor trip.

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-23 to 2-29

*QUESTION D.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The motor drives for the MARK-1 and MARK-F reactor control rods are essentially the same except that the dashpot device has been modified for the MARK-F.

What is the difference between the dashpot devices used in the two reactors?

a. The speed adjustment of the transient rod drive for some experiments on the MARK-F.

b. The location of the dashpot on the MARK-F rods was moved to a location well above the water level.

c. The speed adjustment of the standard rod drive motors for some experiments on the MARK-1.

d. The location of the dashpot on the MARK-F rods was moved to a location well below the water level.

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-23 to 2-29

*QUESTION D.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which of the following detectors are used by the MARK-1 reactor NPP-1000 safety/pulse channel?

a. fission counter detector

b. compensated ion chamber detector

c. scintillation detector

d. uncompensated ion chamber detector

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-51 to 2-54

*QUESTION D.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which of the following detectors are used by the MARK 1 reactor NP-1000 safety channel?

a. fission counter detector

b. compensated ion chamber detector

c. scintillation detector

d. uncompensated ion chamber detector

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-51 to 2-54

*QUESTION D.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The types of nuclear instrumentation used at the Torrey Pines reactor facilities varies to accomodate the wide range of reactor power that must be monitored. The MARK F reactor piccoammeter (K1), within the linear power channel, provides an indication range from source level to approximately 400 kw steady state operation.

Which of the following detectors are used by the K1?

a. fission counter detector

b. compensated ion chamber detector

c. scintillation counter detector

d. uncompensated ion chamber detector

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-51 to 2-54

*QUESTION D.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The types of nuclear instrumentation used at the Torrey Pines reactor facilities varies to accomodate the wide range of reactor power that must be monitored. The MARK 1 reactor NM-1000 Operational Channel provides 10 decades of power indication, from shutdown to full power.

Which of the following detectors are used by the NM-1000?

a. fission counter detector

b. compensated ion chamber detector

c. scintillation counter detector

d. uncompensated ion chamber detector

*ANSWER

a.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-51 to 2-54

END OF CATEGORY D
GO ON TO CATEGORY E

CATEGORY E
SAFETY AND EMERGENCY SYSTEMS

*QUESTION E.01 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK 1 reactor fuel temperature safety channels are redundant, fail-safe monitors of fuel temperature. The channels will scram the reactor when the trip limit is reached.

What is this trip limit?

a. 500 degrees F

b. 800 degrees C

c. 500 degrees C

d. 800 degrees F

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-19

*QUESTION E.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK 1 reactor fuel temperature safety channels are redundant, fail-safe monitors of fuel temperature.

What kind of temperature sensors provide the functional instrument signal to these channels?

a. Resistance Temperature Detector (RTD)

b. Type K thermocouples

c. Thermistor Type Device (TTD)

d. Type K doppler resonators

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-19

*QUESTION E.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK 1 reactor fuel temperature safety channels are redundant, fail-safe monitors of fuel temperature.

Where are the temperature sensors associated with these channels physically located?

a. within instrumented fuel elements.

b. integrated with the excore nuclear instrumentation.

c. within instrumented poison elements.

d. integrated with the incore nuclear instrumentation.

*ANSWER

a.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-19

*QUESTION E.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Two types of temperature probes are used to monitor the TRIGA MARK 1 pit water temperature. One of these is made out of platinum and feeds a signal to the Control System Console (CSC) via the Data Aquisition and Control Unit (DAC).

What type of temperature detector is in the probe that feeds CSC pool temperature indication?

a. Resistance Temperature Detector (RTD)

b. Type K thermocouples

c. Thermistor Type Device (TTD)

d. Type K doppler resonator

*ANSWER

a.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-33

*QUESTION E.05 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Two types of temperature probes are used to monitor the TRIGA MARK 1 pit water temperature. One of these feeds a digital monitor in the auxiliary console.

What type of temperature detector is in the probe that feeds auxiliary console pool temperature indication?

a. Resistance Temperature Detector (RTD)

b. Type K thermocouples

c. Thermistor Type Device (TTD)

d. Type K doppler resonator

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 2-33

*QUESTION E.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The TRIGA MARK 1 ventilation system consists of an exhaust blower and absolute filter.

Where are the exhaust blower and absolute filter located?

a. in the attic above the MARK 1 reactor room

b. along the wall next to the storage yard

c. in the attic above the MARK F reactor room

d. along the wall next to the counting room

*ANSWER

a.

*REFERENCE *

GA Reactor Operator Training Manual, pp. 1-37

*QUESTION E.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The TRIGA MARK 1 ventilation system absolute filter is fit with a radiation detector that feeds a monitor in the auxiliary instrument rack. This process radiation system initiates an automatic protective function upon reaching its setpoint.

What is the setpoint for this automatic function?

a. 5 R/hr.

b. 45 R/hr

c. 5 mR/hr.

c. 45 mR/hr.

*ANSWER

c.

*REFERENCE *

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION E.08 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The TRIGA MARK 1 ventilation system absolute filter is fit with a radiation detector that feeds a monitor in the auxiliary instrument rack. This process radiation system initiates an automatic protective function upon reaching its setpoint.

What is this automatic function?

a. initiates an automatic isolation of the MARK 1 ventilation system and reactor room

b. initiates an audible alarm and light in the MARK 1 control room

c. releases the interlock that blocked the manual isolation of the MARK 1 ventilation system

d. initiates a flashing amber alarm in the MARK 1 reactor room

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION E.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

A release of fission products from a damaged fuel element into the MARK F reactor room has occurred.

Which design characteristic of the MARK F ventilation system minimizes the release?

a. All radiation is discharged to the MARK 1 reactor room, where the absolute filter traps it.

b. Common emergency exhaust blowers initiate so that a minimum .05 in of water under-pressure is maintained.

c. All radiation is discharged to the common vent stack where it is diluted to acceptable levels and released.

d. Gaskets are installed on all doors to the room so that a minimum .05 in of water under-pressure is maintained.

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

#QUESTION E.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What type of radiation detector counter is mounted in the MARK 1 reactor PIT WATER monitor box?

a. Geiger-Muller counter

b. scintillation detector

c. fission chamber

d. proportional BF3 ion chamber

#ANSWER

a.

#REFERENCE $

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION E.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The radioactivity monitor system for MARK 1 PIT WATER radioactivity initiates an automatic protective function upon reaching its preset setpoint.

What is the PRESET setpoint for this automatic function?

a. 5 R/hr.

b. 45 R/hr

c. 5 mR/hr.

d. 45 mR/hr.

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION E.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The radioactivity monitor system for MARK 1 PIT WATER radioactivity initiates an automatic protective function upon reaching its preset setpoint.

What is this automatic function?

a. initiates an automatic isolation of the MARK 1 ventilation system and reactor room

b. initiates a flashing amber alarm on the CSC

c. releases the interlock that blocked the manual isolation of the MARK 1 ventilation system

d. initiates an audible alarm and light

*ANSWER

d.

*REFERENCE *

GA Reactor Operator Training Manual, pp. 1-37 & 2-33

*QUESTION E.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the maximum permissible activity in the pool water?

a. 1.0 microcuries per cubic centimeter

b. 0.1 curies per cubic centimeter

c. 0.1 microcuries per cubic centimeter

d. 1.0 curie per cubic centimeter

*ANSWER

c.

*REFERENCE *

GA Reactor Operator Training Manual, pp. 1-32 & 1-33

#QUESTION E.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Based on both the MARK F and MARK 1 Technical Specifications:

What is the reactivity [Keff] limit for storage of spent fuel?

a. Keff must be less than 0.60 for all conditions of moderation?

b. Keff must be less than 0.70 for all conditions of moderation?

c. Keff must be less than 0.80 for all conditions of moderation?

d. Keff must be less than 0.90 for all conditions of moderation?

#ANSWER

c.

#REFERENCE #

MARK F and MARK 1 Technical Specifications

*QUESTION E.15 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK 1 Technical Specifications state that fueled experiments which are NOT covered elsewhere in the Technical Specifications will be limited so that the total inventory of iodine 131 and 135 in each experiment is restricted.

What is this inventory limit for fueled experiments?

a. 1.5 microcuries of iodine 131 and 135

b. 1.5 curies of iodine 131 and 135

c. 1.5 millirem of iodine 131 and 135

d. 1.5 rem of iodine 131 and 135

*ANSWER

b.

*REFERENCE *

MARK 1 Technical Specifications, 8.2.4

END OF CATEGORY E
GO ON TO CATEGORY F

CATEGORY F
STANDARD AND EMERGENCY OPERATING PROCEDURES

*QUESTION F.01 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

In accordance with the GA Torrey Pines Operating Procedures and the Code of Federal Regulations:

Which of the following situations would require the DIRECT supervision of a licensed SENIOR reactor operator?

a. an unlicensed individual unloading fuel from the core

b. a reactor operator trainee during start-up operation

c. a student who is operating the reactor for training as a part of his/her courses

d. an individual operating the MARK 1 reactor who is licensed at another TRIGA facility

*ANSWER

a.

*REFERENCE

10CFR55.13
SOP 11, MK 1 & MK F

*QUESTION F.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Following a SCRAM the MARK 1 control rods did not drop into the core. Per the Alarm and Scram Procedures, as the Reactor Operator you:

* try the manual scram bar and turn off the magnet power key
* secure console power, and then restore it, and
* try to insert fuel rods by hand and insert spare control rods

What is the one(1) other thing that you can do to shut the reactor down in accordance with the procedures?

a. dump the emergency 50 gallon drums containing soluble Boron into the reactor pool.

b. remove fuel, starting at the B-ring

c. dump the emergency 50 gallon drums containing soluble Cadmium in into the reactor pool.

d. remove fuel, starting at the D-ring

*ANSWER

b.

*REFERENCE

SOP VI-7, MK 1

*QUESTION F.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Following a SCRAM the MARK 1 control rods did not drop into the core. Per the Alarm and Scram Procedures, as the Reactor Operator you:

* try the manual scram bar and turn off the magnet power key
* secure console power, and then restore it, and
* try to insert fuel rods by hand and insert spare control rods

Why is it required to restore power to the console?

a. so that the radiation monitors would still work

b. so that fuel temperature could still be monitored

c. so that the conductivity monitors would still work

d. so that the power channels could still be monitored

*ANSWER

d.

*REFERENCE

SOP VI-7, MK 1

*QUESTION F.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Where are the power supplies for the control rod electromagnets in the SCRAM circuit, rod mechanism potentiometers, and the solenoid controlling air to the transit rod located?

a. Data and Aquisition and Control Unit, Shelf 1

b. Control System Console, Module 1

c. Data and Aquisition and Control Unit, Shelf 7

d. Control System Console, Module 7

*ANSWER

a.

*REFERENCE

SOP VI-7, MK 1
GA Reactor Operator Training Manual, pp. II-1 to II-14

*QUESTION F.05 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The "watchdog" board acts as a monitor for MARK 1 reactor control computer software by providing four completely independent power outputs to separate software modules.

Where is this "watchdog" board located?

a. Data and Aquisition and Control Unit, Shelf 1

b. Control System Consule, Module 1

c. Data and Aquisition and Control Unit, Shelf 7

d. Control System Console, Module 7

*ANSWER

c.

*REFERENCE

SOP VI-7, MK 1
GA Reactor Operator Training Manual, pp. II-1 to II-14

*QUESTION F.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The "watchdog" board acts as a monitor for MARK 1 reactor control computer software by providing four completely independent power outputs to separate software modules.

What is the one other function of this "watchdog" board?

a. warns the the Reactor Operator of excessive control relay contact voltage

b. shuts down the reactor in case of a computer malfunction

c. warns the the Reactor Operator of excessive control rod magnet voltage

d. fail-safe power supply to the SCRAM circuit

*ANSWER

b.

*REFERENCE

SOP VI-7, MK 1
GA Reactor Operator Training Manual, pp. II-1 to II-14

*QUESTION F.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

TRIGA facility Radiological Safety requirements specify that only containers made of a certain type of material may be used for fissionable isotopes irradiated during In-Core experiments in the rotary specimen rack.

What type of material must these isotope containers be made of?

a. steel

b. aluminum

c. copper

d. ziconium

*ANSWER

b.

*REFERENCE

Radiological Safety, V-5 to V-6

*QUESTION F.08 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Considering the radiological safety aspects of in core experiments:

What is the PRINCIPAL atvantage of using plastic sample containers when irradiating specimens?

a. activation of plastic is minimized by the low neutron microscopic cross section of plastic

b. plastic is highly resistive to gamma flux degradation

c. corrosion of plastic is minimized by the low neutron microscopic cross section of plastic

d. plastic is highly resistive to thermal flux degradation

*ANSWER

a.

*REFERENCE

Radiological Safety, V-5 to V-6

*QUESTION F.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

There are two external SCRAM circuits that cannot be automatically tested by the Data Acquisition and Control Unit (DAC) of the MARK 1 reactor. However, these inputs may be tested manually. Per the MARK 1 Operating Procedures:

How is the "King Furnace" SCRAM manually LOCALLY tripped?

a. by quickly removing and then restoring auxiliary breaker power

b. by removing the jumper on the back panel of the auxiliary D.C. power supply

c. by quickly removing and then restoring auxiliary 120 VAC power

d. by removing the jumper on the front panel of the "furnace" power supply

*ANSWER

d.

*REFERENCE

SOP II, II-11

*QUESTION F.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK 1 reactor Technical Specifications limit the maximum operating power level, except for pulsing operations.

What is this maximum operating power level?

a. 250 kilowatts

b. 1500 kilowatts

c. 250 watts

d. 1500 watts

*ANSWER

a.

*REFERENCE

MARK 1 reactor Technical Specifications, 7.0

*QUESTION F.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK F reactor Technical Specifications limit the maximum operating power level, except for pulsing operations.

What is this maximum operating power level?

a. 250 kilowatts

b. 1500 kilowatts

c. 250 watts

d. 1500 watts

*ANSWER

b.

*REFERENCE

MARK F reactor Technical Specifications, 9.0

*QUESTION F.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

MARK F Technical Specifications basically limit "transient operations" via TWO other parameters besides reactor power.

What are these TWO parameters?

a. cladding temperature and transient reactivity added

b. fuel can pressure and fuel temperature added

c. fuel temperature and transient reactivity added

d. fuel can pressure and cladding temperature added

*ANSWER

c.

*REFERENCE

MARK F reactor Technical Specifications, 9.2

*QUESTION F.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The physical security controls for the MARK F reactor are stricter that for the MARK 1 facility. The spaces within the MARK F reactor room must be actively monitored with all intrusion alarms set in the "secure mode" when the area is UNOCCUPIED.

When is the MARK F reactor room considered "OCCUPIED?"

a. when an armed security guard is present in the reactor room

b. when a licensed Reactor Operator or Senior Reactor Operator is at the reactor console

c. when an armed security guard is within a five minute walking distance from the reactor room

d. when the "Senior Physicist in Charge" is in the reactor room

*ANSWER

b.

*REFERENCE

Administrative Procedures and Requirements, III-16

*QUESTION F.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Why are the physical security controls for the MARK F reactor stricter that for the MARK 1 facility?

a. much of the fuel contains uranium enriched above 20 weight percent

b. secret Department of Defense experiments involving thermionic testing

c. much of the fuel contains plutonium-239, above 20 weight percent

d. secret Department of Defense experiments involving thermo nuclear testing

*ANSWER

a.

*REFERENCE

Administrative Procedures and Requirements, III-16

*QUESTION F.15 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The MARK F reactor Standard Operating Procedures for fuel loading and unloading require that all fuel moves be logged in three places. One of these places is on the fuel cards.

Which one of the following correctly describes the other two places where fuel movements must be logged and how they are logged?

a. in the logbook with black ink, and on the core display board

b. flagged with a red sticker in the logbook, and on the core display board

c. in the logbook with red ink, and on the core display board

d. flagged with a green sticker in the logbook, and on the core display board

*ANSWER

c.

*REFERENCE

SOP XI, MARK F

END OF CATAGORY F
GO ON TO CATEGORY G

CATEGORY G
RADIATION CONTROL AND SAFETY

*QUESTION G.01 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The portable survey instruments available at the GA Torrey Pines facilities are used to detect the presence of ionizing radiation. One type of instrument uses a pancake like detector on the end of a 2 foot coaxial cable. The detector is sensitive to both gamma and beta low energy radiation, which supports four range settings on the instrument from 500 CPM to 500,000 CPM full scale.

Which ONE of the following portable survey instruments fits this description?

a. Geiger counter (Ludlum Model 3)

b. Snoopy (NP-2)

c. Eberline PAC 1SA

d. Juno Model

*ANSWER

a.

*REFERENCE $

GA Reactor Operator Training Manual, V-14 to V-15

*QUESTION G.02 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The portable survey instruments available at the GA Torrey Pines facilities are used to detect the presence of ionizing radiation. One type of instrument is mainly used as a general survey meter. It is an ion-chamber and is capable of quantitative measurements of beta and gamma radiation. It has a range of 2.5 mR/hr to 250 R/hr full scale.

Which ONE of the following portable survey instruments fits this description?

a. Geiger counter (Ludlum Model 3)

b. Snoopy (NP-2)

c. Eberline PAC 1SA

d. Juno Model

*ANSWER

d.

*REFERENCE *

GA Reactor Operator Training Manual, V-14 to V-15

*QUESTION G.03 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which ONE of the following portable survey instruments detects ALPHA radiation using a scintillation-type detector?

a. Geiger counter (Ludlum Model 3)

b. Snoopy (NP-2)

c. Eberline PAC 1SA

d. Juno Model

*ANSWER

c.

*REFERENCE *

GA Reactor Operator Training Manual, V-15

*QUESTION G.04 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The NEUTRON radiation detector, available at GA, has a radiometer that reads full scale 2 mRem/hr in four ranges [x1, x 10, x100, and x1000].

Which ONE of the following portable survey instruments fits this description?

a. Geiger counter (Ludlum Model 3)

b. Snoopy (NP-2)

c. Eberline PAC 1SA

d. Juno Model

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, V-15

*QUESTION G.05 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which is one of the characteristics of fast NEUTRON type radiation?

a. it has more penetrating power than BETA radiation

b. it has less ionizing power than BETA radiation

c. it is usually classified as having a positive charge

d. it is electromagnetic radiation

*ANSWER

a.

*REFERENCE $

Nuclear Energy, Raymond L. Murray, 1975 Pergamon Press INC.
GA Reactor Operator Training Manual, Chapter V

*QUESTION G.06 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which is one of the characteristics of ALPHA radiation?

a. it has more penetrating power than BETA radiation

b. it has less ionizing power than BETA radiation

c. it is usually classified as having a positive charge

d. it is electromagnetic radiation

*ANSWER

c.

*REFERENCE $

Nuclear Energy, Raymond L. Murray, 1975 Pergamon Press INC.
GA Reactor Operator Training Manual, Chapter V

*QUESTION 6.07 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Ingestion of what type of radioactive materials will cause the most internal biological damage due to cell ionization?

a. BETA emitters

b. GAMMA emitters

c. XRAY emitters

d. ALPHA emitters

*ANSWER

d.

*REFERENCE $

Nuclear Energy, Raymond L. Murray, 1975 Pergamon Press INC.
GA Reactor Operator Training Manual, Chapter V

#QUESTION 6.08 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The continuous monitors used at the TRIGA Reactors Facility are usually "fixed position" detectors and are used to warn of fuel/experiment failure, or other hazardous radiological event.

Which of the following devices is used to satisfy the Technical Specification requirement for activating the evacuation alarm?

a. Continuous Air Monitor (CAM)

b. RM-12

c. Radiation Area Monitor (RAM)

d. Eberline RM-14

#ANSWER

c.

DELETED

#REFERENCE $

GA Reactor Operator Training Manual, Chapter V-17 to V-24
GA Technical Specifications, MK-1 & MK-F

*QUESTION G.09 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The continuous monitors used at the TRIGA Reactors Facility are usually "fixed position" detectors and are used to warn of fuel/experiment failure, or other hazardous radiological event.

Which of the following devices is for high gamma field radiation detection and activates the "criticality" alarm?

a. Continuous Air Monitor (CAM)

b. RM-12

c. Radiation Area Monitor (RAM)

d. Eberline RM-14

*ANSWER

b.

*REFERENCE $

GA Reactor Operator Training Manual, Chapter V-17 to V-24

*QUESTION G.10 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

The continuous monitors used at the TRIGA Reactors Facility are usually "fixed position" detectors and are used to warn of fuel/experiment failure, or other hazardous radiological event.

Which of the following devices is mounted on top of the reactor tank and maintains a chronological record of activity via a chart recorder?

a. Continuous Air Monitor (CAM)

b. RM-12

c. Radiation Area Monitor (RAM)

d. Eberline RM-14

*ANSWER

a.

*REFERENCE $

GA Reactor Operator Training Manual, Chapter V-17 to V-24

*QUESTION G.11 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the 10CFR20 limit for exposure to the SKIN of the whole body?

a. 1.25 rem/calender quarter

b. 3.0 millirem/calender quarter

c. 7.5 rem/calender quarter

d. 18.75 rem/calender quarter

*ANSWER

c.

*REFERENCE $

GA Reactor Operator Training Manual, Chapter V-30 to V-31
10CFR20

*QUESTION G.12 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

What is the 10CFR20 limit for exposure to the hands and feet?

a. 1.25 rem/calender quarter

b. 3.0 millirem/calender quarter

c. 7.5 rem/calender quarter

d. 18.75 rem/calender quarter

*ANSWER

d.

*REFERENCE $

GA Reactor Operator Training Manual, Chapter V-30 to V-31
10CFR20

*QUESTION G.13 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

A sealed specimen container which is more radioactive than ecpected was dropped on the laboratory floor. The resulting dose rate due to the specimen and activated container at ten feet is 25 mR/hr. Assuming that the efficiency of the detector does not change and that background is negligible:

What is the dose rate at a distance of one [1] foot?

a. 250 mR/hr

b. 2500 mR/hr

a. 25000 mR/hr

b. 250000 mR/hr

*ANSWER

b.

$D2 = D1 \times [d1/d2]^2$

$D2 = 25 \times 100 = 2500$ mR/hr

*REFERENCE $

Standard Distance-Time-Shielding calculation, previous Facility reviewed examinations;
Examination Equation Sheet

*QUESTION G.14 [1.0]

MULTIPLE CHOICE, SELECT THE CORRECT ANSWER

Which of the following correctly describes the access limitations to the TRIGA Reactors Facility for a pregnant woman?

a. Pregnant woman shall be admitted ONLY with the permission of the Physicist In Charge (PIC).

b. Pregnant woman shall be admitted if their whole body exposure is limited to 500 Rem during their pregnancy.

c. Pregnant woman shall NEVER be permitted into the Facility.

d. Pregnant woman shall be admitted ONLY with the permission of the Managing Director, TRIGA Group.

*ANSWER

c.

*REFERENCE $

GA Administrative Procedures, pp. 19

END OF CATEGORY G
END OF EXAM