SAWA UNIVERSITY

اساسيات الفيزياء الشعاعية/ الكورس الاول

GENERATING THE TUBE VOLTAGE

Sawa University	جامعـــــــة ســـــــاوة الاهلية
College of health and medical techniques	كليـــــة التقنيـــات الصحيـة والطبيـة
Department of Radiology Tech.	قسم تقنيات الاشعة والسونار
Second Stage	المرحلـــــــــــــة الثانية

محاضرة رقم (1)

Lecture No. (1)

الجانب العملي

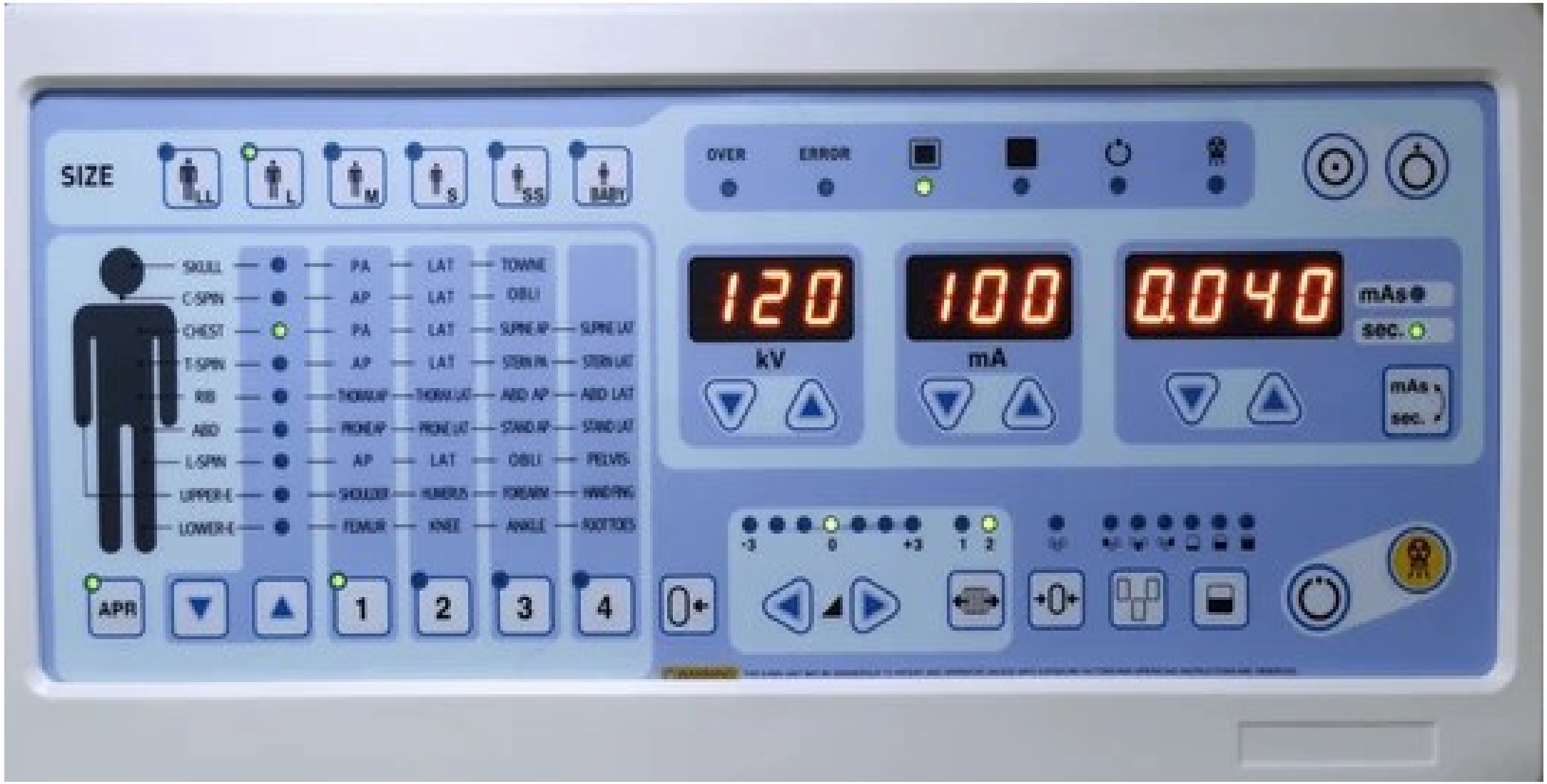
Practical

تدريسي المادة : م.م. احمد عكاب شراد

(CONSOLE)



(CONSOLE)


SIZE
XL
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C-SPIN
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LOWER-E
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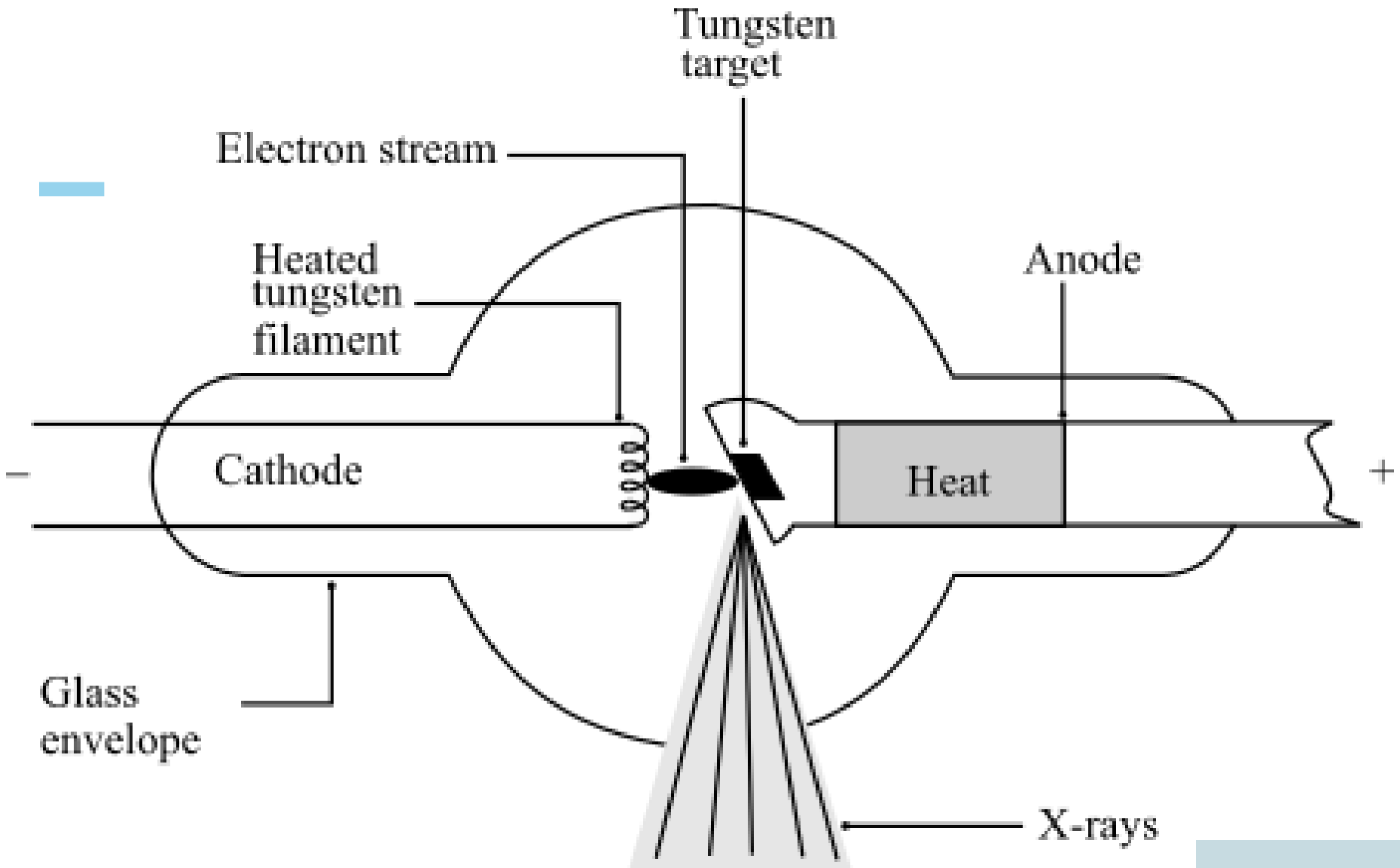
AP
LAT
TOWNE
OBLI
SUPINE AP
SUPINE LAT
ABD AP
ABD LAT
STAND AP
STAND LAT
PELVIS
SHOULDER
HUMERUS
FOREARM
HAND-PAL
FEMUR
KNEE
ANGLE
FOOT-DOS
120
kV
100
mA
0040
mAs
sec.
APR
1
2
3
4
0+
+0+

(X-RAY TUBE)


Tungsten target
Electron stream
Heated tungsten filament
Anode
Cathode
Heat
–
+
Glass envelope
X-rays

(X-RAY TUBE)



(KVP)

- **Adjusting Tube Voltage Example:**
  - Chest → 120 kVp, low mAs.
  - Extremity → 60 kVp, high mAs.
- **kVp and Image Contrast**
  - Low kVp phantom: high contrast, but noisy.
  - High kVp phantom: low contrast, smoother image.
  - Clinical correlation: abdominal vs. chest imaging.

(KVP)

- **Exposure Time in Practice**
  - Long exposure (1s): blurred hand phantom.
  - Short exposure (0.05s): sharp hand phantom.
  - Application: important for children and chest x-rays.
- **Advantages of Falling Load**
  - Time-sensitive imaging (cardiac, angiography).
  - Tube protection (prevents burnout).
  - Pediatric imaging: very short exposures reduce motion.

■ Balancing kVp, mA, and Time

Same mAs but different settings:

- 80 kVp, 100 mA, 0.5s = 50 mAs.
- 80 kVp, 200 mA, 0.25s = 50 mAs.

Both give same dose, but second reduces motion blur.

■ Troubleshooting Examples

- Image too dark: excessive mAs or kVp.
- Image too light: insufficient filament heating.
- Tube overload error: ignored falling load limits.
- Motion blur: exposure time too long.

Any questions?



Lecture 1 | Practical review: 10 MCQs

One correct answer per question. Correct answers appear in green.

1. At the console, which control sets electron accelerating potential?
A. mA **B. kVp ✓**
C. Timer D. Collimator
E. SID

2. A hand phantom blurs during a 1 s exposure. What helps most?
A. Longer time **B. Shorter time ✓**
C. Lower mA only D. Larger field
E. More filtration

3. 100 mA for 0.5 s gives:
A. 5 mAs B. 20 mAs
C. 50 mAs ✓ D. 100 mAs
E. 500 mAs

4. Which setting also gives 50 mAs?
A. 200 mA × 0.25 s ✓ B. 100 mA × 0.05 s
C. 50 mA × 0.5 s D. 500 mA × 0.5 s
E. 200 mA × 0.5 s

5. A higher kVp generally produces photons with:
A. Lower maximum energy **B. Greater penetration ✓**
C. Shorter exposure time automatically D. No change in energy
E. Reduced anode rotation

6. A 120 kVp chest setting is used mainly for:
A. Penetration ✓ B. Mechanical cooling
C. Smaller film D. Lower electron speed
E. Lower energy limit

7. Which setting directly changes total electron flow per second?
A. mA ✓ B. SID
C. Grid ratio D. Collimation
E. Anode angle

8. Falling-load operation begins at:
A. Maximum allowable mA ✓ B. Zero kVp
C. Minimum mA D. Maximum time
E. No tube current

9. For moving anatomy, the 200 mA/0.25 s choice versus 100 mA/0.5 s:
A. Shortens time at same mAs ✓ B. Doubles mAs
C. Halves mAs D. Raises kVp
E. Stops motion entirely

10. The heated cathode filament supplies electrons by:
A. Thermionic emission ✓ B. Bremsstrahlung
C. Photoelectric absorption D. Cooling oil
E. Rectification