

Quiz (Factors in Choosing Chemical Cells)

1. Match the terms on the left with the descriptions on the right.

<u>Term</u>	<u>Description</u>
(a) Chemical cell	(1) the duration of storage (at 21°C), at the end of which a cell retains only 90% capacity
(b) Battery	(2) the medium which allows ionic conduction between the two electrodes of a cell
(c) Service life	(3) the place into which electrons flow from the external circuit
(d) Shelf life	(4) a combination of two or more cells
(e) Positive electrode	(5) the period of effective service of a cell under specified conditions, before its voltage falls to a certain value
(f) Negative electrode	(6) the device which is capable of converting chemical energy into electrical energy
(g) Electrolyte	(7) the place from which electrons flow into the external circuit

(a) _____ (b) _____ (c) _____ (d) _____

(e) _____ (f) _____ (g) _____

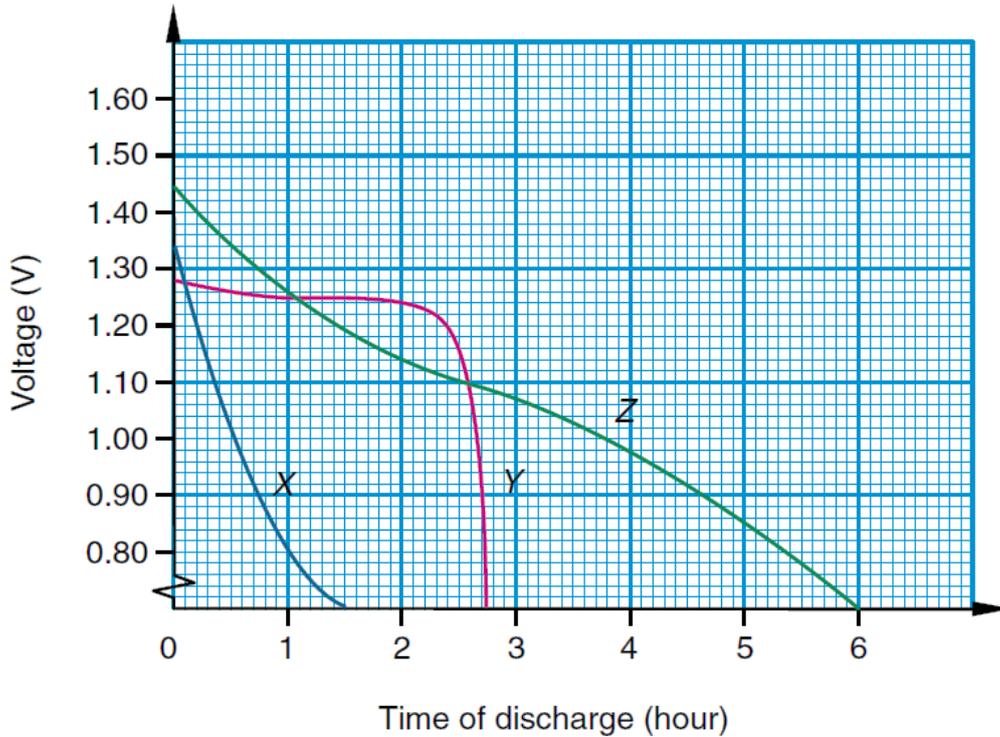
2. Silver oxide cells are a common type of cells used in daily life.

(a) Explain why silver oxide cells are suitable for use in hearing aids.

(b) Explain why silver oxide cells are expensive.

(c) State whether a silver oxide cell is a dry cell or a wet cell. Explain briefly.

3. Three AA-sized cells – a zinc-carbon cell (X), a nickel-metal hydride cell (Y) and an alkaline manganese cell (Z) are under test. Each cell is continuously discharged (by connecting to a motorized toy), until its voltage drops to below 0.8 V. Three discharge curves are shown in the graph on the next page, one for each cell.



- We usually consider a cell 'dead' if its voltage drops to 0.8 V. Which type of cell becomes 'dead' suddenly?
- What voltage range would the alkaline manganese cell have during its first hour of discharge?
- What voltage would the nickel-metal hydride cell maintain during discharge?
- Which cell has the shortest service life?
- What is the approximate value of the ratio service life of alkaline manganese cell service life of zinc-carbon cell?
- For the electronic appliances shown below, which cell should NOT be used? Explain your answer.

4. The following table shows some information about three types of chemical cells.

Type	Voltage over discharge	Price per cell (\$)	Service life (minute)	Shelf life (year)
Zinc-carbon cell (AA size)	falls rapidly	2.0	60	1.5
Alkaline manganese cell (AA size)	remains steady	4.5	90	3
Silver oxide cell (button type)	remains steady	8.0	130	2

- (a) Which type of cell should be used in a TV remote control? Explain your answer.
- (b) A package of five silver oxide cells is sold at a special price of \$34.90. Assuming that your calculator consumes two silver oxide cells per year, would you buy a package of these specially-priced cells for the use of your calculator? Explain your answer.

Suggested Answer

1. (a) **(6)** (b) **(4)** (c) **(5)** (d) **(1)**
(e) **(3)** (f) **(7)** (g) **(2)**
2. (a) Hearing aids are small and they need very small cells.
Silver oxide cells (shaped like a button) would serve this purpose.
(b) Silver and its compounds (e.g. silver oxide) are expensive.
(c) It is a dry cell because the electrolyte in silver oxide cells is a paste rather than a liquid.
3. (a) Nickel-metal hydride cell
(b) 1.26 V–1.45 V
(c) Around 1.25 V
(d) Zinc-carbon cell
(e) $5.351 = 5.35$
(f) Zinc-carbon cell. The electronic appliances shown are high-drained devices and zinc-carbon cells cannot supply a large steady current.
4. (a) Zinc-carbon cell should be used because it is cheap. Besides, a TV remote control needs not draw a large current.
(b) No. As the shelf life of silver oxide cells is two years, only four silver oxide cells will be consumed in two years.
Price of four silver oxide cells (without special offer) = $4 \times \$8.0 = \32.0 .
Therefore, a package of specially-priced cells (\$34.90) is more expensive.