ADDITIONAL QUESTIONS ON ELECTROCHEMISTRY AND NUCLEAR CHEMISTRY

Question 1: A constant current of 0.025 amps is passed through a 1 Molar solution of $Cr(NO_3)_3$ for 6 hours. How many coulombs of charge is this equivalent to?

(a)   648 coulombs

(b)   540 coulombs

(c)   324 coulombs

(d)   188 coulombs

(e)   None of the above values are correct

Question 2: A constant current of 0.025 amps is passed through a 1 Molar solution of $Cr(NO_3)_3$ for 6 hours. How many moles of electrons is this equivalent to? Faradays constant is 96,500 Coulombs/mole

(a)   0.006715 moles of electrons

(b)   0.000580 moles of electrons

(c)   0.001948 moles of electrons

(d)   0.003358 moles of electrons

(e)   0.005596 moles of electrons

Question 3: A constant current of 0.025 amps is passed through a 1 Molar solution of $Cr(NO_3)_3$ for 6 hours. How many grams of silver metal would be produced? The molar mass of Cr is 51.97 grams/mole Faradays constant is 96,500 Coulombs/mole

Hint: $Cr^{3+}_{(aq)} + 3 e^- \text{-----------} > Cr_{(metal)}$

(a)   0.3622 grams of chromium

(b)   0.7243 grams of chromium

(c)   0.1811 grams of chromium

(d)   0.0626 grams of chromium

(e)   none of the above answers are correct

Question 4: What is an alpha particle?

(a)   A high-speed electron

(b)   A helium nucleus

(c)   A high energy photon

(d)   A proton that has captured an electron and has been converted into a neutron

(e)   None of the above answers are correct

Question 5: What is the question mark needed to balance the nuclear reaction given below:

$$^{239}_{94}Pu + 2\,^{1}_{0}n ----> ???? + ^{0}_{-1}\beta$$

(a) $^{241}_{95}Am$

(b) $^{240}_{95}Am$

(c) $^{241}_{93}Np$
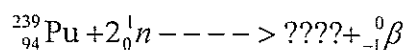
(d) $^{240}_{95}Th$

(e)   Correct answer is not given

Question 6: What is the question mark needed to balance the nuclear reaction given below:

$$^{253}_{99}Es + ^{4}_{2}\alpha ----> ???? + ^{1}_{0}n$$

(a) $^{256}_{101}Lr$

(b) $^{257}_{101}Lr$

(c) $^{257}_{100}Fm$
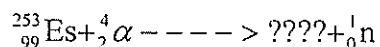
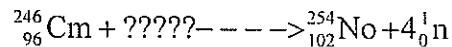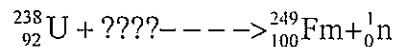(d) $^{256}_{101}Md$
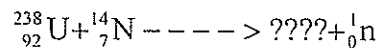
(e)   Correct answer is not given

Question 7: Strontium-90 is a radioactive byproduct of nuclear reactors that behaves biologically like calcium. A sample of Strontium-90 has an activity of 1.2×10^{12} disintegrations per second (d/s). The half-life of Strontium-90 is 29 years. What will be the activity of the strontium-90 sample after 59 years?

(a) 2.9×10^{11} d/s

(b) 1.3×10^{11} d/s

(c) 6.5×10^{11} d/s

(d) 9.2×10^{10} d/s

(e)   None of the above answers are correct

Free response questions:

Question 8: A fabric remnant from a burial site has a $^{14}C/^{12}C$ ratio of 0.735 of its original value. How old is the fabric. The half-life of ^{14}C is 5730 years.

Question 9: Fill in the missing information needed to complete the following nuclear equations:

$$^{238}_{92}U + ^{14}_{7}N ----> ????+^{1}_{0}n$$

$$^{238}_{92}U + ???? ---->^{249}_{100}Fm+^{1}_{0}n$$

$$^{246}_{96}Cm + ????? ---->^{254}_{102}No+4^{1}_{0}n$$

Question 10: The oldest known fossil cells were found in South Africa. The fossil has been dated by the reaction:

$$^{87}Rb ---->^{87}Sr+^{0}_{-1}\beta$$
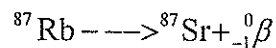
The half-life of Rb-87 is 5×10^{10} years. If the ratio of the present quantity of Rb-87 to the original quantity is 0.951, what is the age of the fossil fuels.

Periodic Table

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIIIB	VIIIB	VIIIB	IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIIIA
1 H 1.01																	2 He 4.00
3 Li 6.94	4 Be 9.01											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 23.00	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.06	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 51.97	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57 *La 138.91	72 Hf 178.49	73 Ta 180.94	74 W 183.85	75 Re 186.21	76 Os 190.20	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.20	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.03	89 †Ac 227.03	104 Unq (261)	105 Unp (262)	106 Unh (263)												

* Lanthanides

58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97

† Actinides

90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np 237.05	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)