1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H 1.008																	2 He 4.003
3 Li 6.941	4 Be 9.012											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 22.99	12 Mg 24.31											13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	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 72.64	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 118.71	51 Sb 121.76	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 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	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)	89 Ac (227)	104 Rf (267)	105 Db (268)	106 Sg (269)	107 Bh (270)	108 Hs (270)	109 Mt (278)	110 Ds (281)	111 Rg (282)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (290)	116 Lv (293)	117 Ts (294)	118 Og (294)

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
90 Th 232.04	91 Pa 231.04	92 U 238.03	93 Np (237)	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 (266)

constants

$R = 0.08206$ L atm/mol K

$R = 8.314$ J/mol K

$N_A = 6.022 \times 10^{23}$ /mol

$h = 6.626 \times 10^{-34}$ J·s

$c = 3.00 \times 10^8$ m/s

$g = 9.81$ m/s^2

conversions

1 atm = 760 torr

1 atm = 101325 Pa

1 atm = 1.01325 bar

1 bar = 10^5 Pa

°F = °C(1.8) + 32

K = °C + 273.15

conversions

1 in = 2.54 cm

1 ft = 12 in

1 yd = 3 ft

1 mi = 5280 ft

1 lb = 453.6 g

1 ton = 2000 lbs

1 tonne = 1000 kg

1 gal = 3.785 L

1 gal = 231 in^3

1 gal = 128 fl oz

1 fl oz = 29.57 mL

water data

$C_{s,ice} = 2.09$ J/g °C

$C_{s,water} = 4.184$ J/g °C

$C_{s,steam} = 2.03$ J/g °C

$\rho_{water} = 1.00$ g/mL

$\rho_{ice} = 0.9167$ g/mL

$\rho_{seawater} = 1.024$ g/mL

$\Delta H_{fus} = 334$ J/g

$\Delta H_{vap} = 2260$ J/g

$K_w = 1.0 \times 10^{-14}$

This exam should have exactly 20 questions. Each question is equally weighted at 5 points each. Bubble in your answer choices on the bubblehseet provided. Your score is based on what you bubble on the bubblesheet and not what is circled on the exam.

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1. Which of the following types of radiation is capable of ionizing organic molecules like DNA?

a. UV-C radiation

b. infrared radiation

c. orange light

d. radio waves

e. blue light

---

2. Compared to yellow light, ultraviolet light will have a...

I. shorter wavelength

II. lower frequency

III. higher energy

IV. greater velocity

a. I, II, III, and IV

b. I and IV

c. I, III, and IV

d. I and III

---

3. Your chemist friend suggests that you tune the radio to 3.0333 m, but you know that radio stations are listed as frequencies in MHz. What radio station is this?

a. 93.7 KLBJ

b. 101.5 KROX

c. 93.3 KGSR

d. 98.9 KUT

e. 103.5 BOB

---

4. What is the wavelength of a 2.45×10^9 Hz wave?

a. 0.753 m

b. 0.122 m

c. 8.17×10^{-18} m

d. 1.62×10^{-24} m

e. 7.53 m

---

5. What is the energy of a single 680 nm red light photon?

a. 2.92×10^{-19} J

b. 2.92×10^{-17} J

c. 3.88×10^{-21} J

d. 2.66×10^{38} J

e. 4.51×10^{-40} J

---

6. It takes light with a frequency of approximately 2.687×10^{15} Hz to break the triple bond between carbon and oxygen in carbon monoxide. Calculate the energy (in kJ/mol) necessary to break one mole of carbon-oxygen triple bonds.

a. 945.2 kJ/mol

b. 4.455×10^{-17} kJ/mol

c. 1.780×10^{-18} kJ/mol

d. 1072 kJ/mol

e. 687.2 kJ/mol

---

7. Complete the sentence regarding the energy levels of an electron in the hydrogen atom. As the principal quantum number increases,

a. the spacing between successive energy levels increases

b. the spacing between successive energy levels decreases

c. the energy levels remain degenerate

d. the spacing between successive energy levels remains constant

---

8. Which of the following quantum number sets is not possible?

a. $n = 4, \quad \ell = 3, \quad m_\ell = 0, \quad m_s = \frac{1}{2}$

b. $n = 4, \quad \ell = 2, \quad m_\ell = 3, \quad m_s = \frac{1}{2}$

c. $n = 1, \quad \ell = 0, \quad m_\ell = 0, \quad m_s = -\frac{1}{2}$

d. $n = 3, \quad \ell = 1, \quad m_\ell = -1, \quad m_s = \frac{1}{2}$

e. $n = 5, \quad \ell = 2, \quad m_\ell = -2, \quad m_s = \frac{1}{2}$

---

9. Which subshell contains an electron with the following quantum number set?

$n = 4, \quad \ell = 0, \quad m_\ell = 0, \quad m_s = \frac{1}{2}$

a. 4s

b. 4p

c. 4d

d. 4f

e. 3s

f. 3p

g. 3d

---

10. How many unpaired electrons will you find in the electronic configuration of nitrogen?

a. 3

b. 2

c. 1

d. 0

e. 5

---

11. What is the electron configuration for the oxide anion?

a. $1s^22s^22p^4$

b. $1s^22s^22p^6$

c. $1s^22s^23p^4$

d. $1s^22s^22p^2$

e. $1s^22s^23p^2$

---

12. What is the electron configuration for selenium, Se?

a. $[Kr]4s^24d^{10}4p^4$

b. $[Ar]4s^24d^{10}4p^6$

c. $[Ar]4s^23d^{10}4p^4$

d. $[Ar]4s^23d^{10}4p^6$

e. $[Ar]4s^24p^4$

---

13. The following species are isoelectronic. Select the atom or ion that will have the largest radius.

a. S^{2-}

b. Ca^{2+}

c. Cl^-

d. Ar

e. K^+

---

14. Name the following compounds: $AlPO_4$ and SO_2?

a. aluminum phosphoxide and sulfur dioxide

b. aluminum phosphate and sulfur dioxide

c. aluminum phosphate and sulfur oxide

d. aluminum phosphite and sulfur oxide

e. aluminum phosphoxide and sulfur oxide

f. aluminum phosphite and sulfur dioxide

---

15. Name the salt with the strongest ionic bond strength:

$MgBr_2$ $CaCl_2$ $MgCl_2$ $CaBr_2$

a. calcium bromide

b. calcium dibromide

c. magnesium chloride

d. magnesium dichloride

e. magnesium dibromide

f. calcium dichloride

---

16. Chromium(III) and sulfide (S^{2-}) form an ionic bond. What is the formula for the ionic compound?

a. Cr_2S_3

b. CrS

c. CrS_3

d. Cr_3S_2

e. Cr_2S

---

17. What is the ionic compound formed between Na and O?

a. Na_2O

b. NaO_2

c. NaO

d. Na_2O_3

e. Na_3O_2

---

18. Identify the set that contains ONLY ionic compounds.

a. $CaCl_2$, HI, H_2O

b. CH_3CH_2OH, Al_2O_3, CH_4

c. $CuCl_2$, NaCl, $HClO_3$

d. HCl, AgCl, Al_2O_3

e. NaBr, Fe_2O_3, $CaCl_2$

---

19. Carbon and oxygen form a polar covalent bond. Which of the following statements accurately uses the periodic table trends to explain why this type of bond forms?

a. Oxygen has a greater electronegativity than carbon, which pulls the shared electrons closer to oxygen.

b. Oxygen has a greater ionization energy than carbon, which transfers electrons from carbon to oxygen.

c. Carbon has a greater electronegativity than oxygen, which pushes the shared electrons closer to oxygen.

d. Carbon has a smaller radius than oxygen, which causes the electrons to be shared between the two atoms.

e. Oxygen and carbon have similar electronegativities, causing the electrons to be shared equally between the two atoms.

---

20. Select the ionic compound with the highest lattice energy.

a. MgO

b. Na_2O

c. NaF

d. $MgCl_2$

e. MgS

Remember to bubble in ALL your answers BEFORE time is called. Double check your name, uteid, and version number before you turn in your bubblesheet. You must keep your exam for future reference. Please do not lose it. We will not replace it.