

1101-2nd Midterm Exam_12/15/21_(A)

1) A 5-ounce cup of raspberry yogurt contains 6.0 g of protein, 2.0 g of fat, and 20.2 g of carbohydrate. The fuel values for protein, fat, and carbohydrate are 17, 38, and 17 kJ/g, respectively. The fuel value of this cup of yogurt is _____ kJ.

- A) 72 B) 630 C) 520 D) 340 E) 720

Answer: C

2) A sample of aluminum metal absorbs 8.32 J of heat, upon which the temperature of the sample increases from 23.2 °C to 30.5 °C. Since the specific heat capacity of aluminum is 0.90 J/g-K, the mass of the sample is _____ g.

- A) 72 B) 1.3 C) 7.5 D) 7.3 E) 65

Answer: B

3) A _____ ΔH corresponds to an _____ process.

- A) positive, endothermic
B) zero, endothermic
C) negative, endothermic
D) zero, exothermic
E) positive, exothermic

Answer: A

4) The internal energy of a system _____.

- A) refers only to the energies of the nuclei of the atoms of the component molecules
B) is the sum of the kinetic energy of all of its components
C) is the sum of the rotational, vibrational, and translational energies of all of its components
D) is the sum of the potential and kinetic energies of the components
E) none of the above

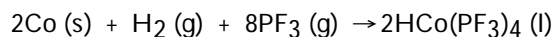
Answer: D

5) For which one of the following reactions is the value of $\Delta H^\circ_{\text{rxn}}$ equal to ΔH°_f for the product?

- A) $\text{H}_2(\text{g}) + 1/2 \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$
B) $2 \text{C}(\text{s, graphite}) + 2 \text{H}_2(\text{g}) \rightarrow \text{C}_2\text{H}_4(\text{g})$
C) $\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}_2(\text{l})$
D) $1/2 \text{N}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{NO}_2(\text{g})$
E) all of the above

Answer: E

6) For the species in the reaction below, ΔH_f° is zero for _____.



- A) $\text{H}_2(\text{g})$
B) $\text{PF}_3(\text{g})$
C) $\text{Co}(\text{s})$
D) $\text{HCo}(\text{PF}_3)_4(\text{l})$
E) both $\text{Co}(\text{s})$ and $\text{H}_2(\text{g})$

Answer: E

7) When a system _____, ΔE is always negative.

- A) gives off heat and does work
- B) absorbs heat and does work
- C) gives off heat and has work done on it
- D) absorbs heat and has work done on it
- E) none of the above is always negative.

Answer: A

8) The specific heat capacity of solid copper metal is 0.385 J/g-K. How many joules of heat are needed to raise the temperature of a 1.55-kg block of copper from 33.0 °C to 77.5 °C?

- A) 1.79×10^5
- B) 5.58×10^{-6}
- C) 26.6
- D) 2.66×10^4
- E) 0.00558

Answer: D

9) The specific heat capacity of methane gas is 2.20 J/g-K. How many joules of heat are needed to raise the temperature of 5.00 g of methane from 36.0 °C to 75.0 °C?

- A) 429
- B) 22.9
- C) 0.0113
- D) 1221
- E) 88.6

Answer: A

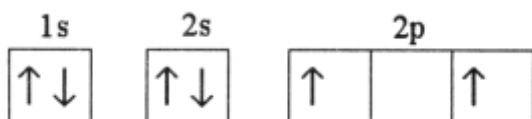
10) Which one of the following is an incorrect orbital notation?

- A) 4s
- B) 3p_y
- C) 3f
- D) 2s
- E) 4d_{xy}

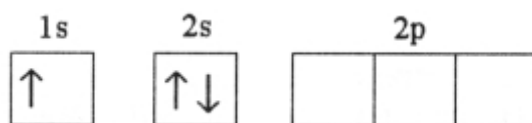
Answer: C

11) Which electron configuration represents a violation of the Pauli exclusion principle?

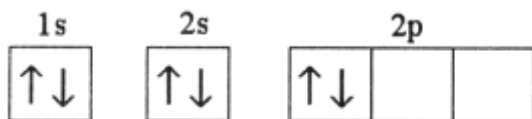
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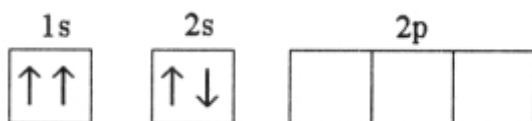
B)



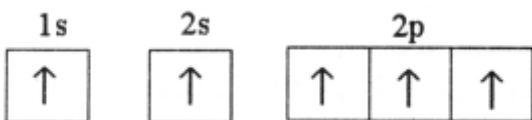
C)



D)



E)



Answer: D

12) Which one of the following configurations depicts an excited oxygen atom?

- A) [He]2s²2p⁴
- B) 1s²2s²2p²
- C) 1s²2s²2p¹
- D) 1s²2s²2p²3s²
- E) 1s²2s²2p⁴

Answer: D

13) Electromagnetic radiation with a wavelength of 531 nm appears as green light to the human eye. The energy of one photon of this light is 3.74×10^{-19} J. Thus, a laser that emits 1.3×10^{-2} J of energy in a pulse of light at this wavelength produces _____ photons in each pulse.

- A) 9.2×10^{-24}
- B) 3.5×10^{16}
- C) 2.9×10^{-17}
- D) 6.5×10^{13}
- E) 1.8×10^{19}

Answer: B

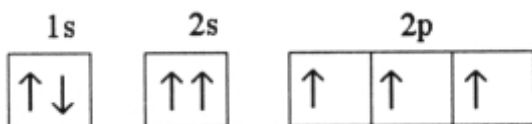
14) The ground state configuration of tungsten is _____.

- A) [Xe]6s²4f¹⁴5d⁴
- B) [Ne]3s¹
- C) [Ar]4s²3d³
- D) [Xe]6s²4f⁷
- E) [Kr]5s²4d¹⁰5p⁵

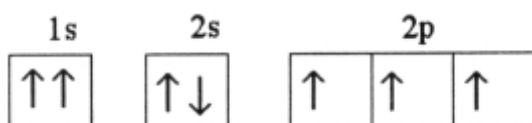
Answer: A

15) Which one of the following is the correct electron configuration for a ground-state nitrogen atom?

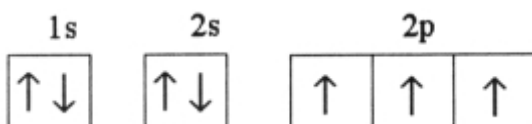
A)



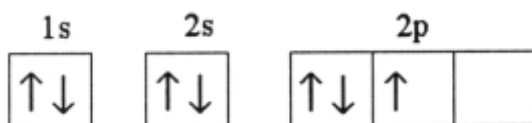
B)



C)



D)



E) None of the above is correct.

Answer: C

16) Consider the general valence electron configuration of ns^2np^5 and the following statements:

- (i) Elements with this electron configuration are expected to form -1 anions.
- (ii) Elements with this electron configuration are expected to have large positive electron affinities.
- (iii) Elements with this electron configuration are nonmetals.
- (iv) Elements with this electron configuration form acidic oxides.

Which statements are true?

- A) (i), (iii), and (iv)
- B) (ii) and (iii)
- C) (i) and (ii)
- D) (i), (ii), and (iii)
- E) All statements are true.

Answer: A

17) Chlorine is much more suitable to exist as an anion than is sodium. This is because _____.

- A) chlorine is more metallic than sodium
- B) chlorine has a greater electron affinity than sodium does
- C) chlorine has a greater ionization energy than sodium does
- D) chlorine is a gas and sodium is a solid
- E) chlorine is bigger than sodium

Answer: B

18) Alkaline earth metals _____.

- A) form basic oxides
- B) exist as triatomic molecules
- C) form monoanions
- D) have the smallest atomic radius in a given period
- E) form halides with the formula MX

Answer: A

19) Which one of the following elements has an allotrope that is produced in the upper atmosphere by lightning?

- A) Cl
- B) N
- C) O
- D) S
- E) He

Answer: C

20) Which of the following does not have eight valence electrons?

- A) Rb^{+1}
- B) Ti^{+4}
- C) Xe
- D) Cl^{-}
- E) Sr^{+1}

Answer: E

21) Of the following, _____ cannot accommodate more than an octet of electrons.

- A) V
- B) Ni
- C) As
- D) C
- E) Y

Answer: D

22) There are _____ valence electrons in the Lewis structure of CH_3CH_2Cl .

- A) 20
- B) 14
- C) 10
- D) 12
- E) 18

Answer: A

23) Why don't we draw double bonds between the Be atom and the Cl atoms in BeCl₂?

- A) That would result in the formal charges not adding up to zero.
- B) There aren't enough electrons.
- C) That would result in more than eight electrons around beryllium.
- D) That would result in more than eight electrons around each chlorine atom.
- E) That would give positive formal charges to the chlorine atoms and a negative formal charge to the beryllium atom.

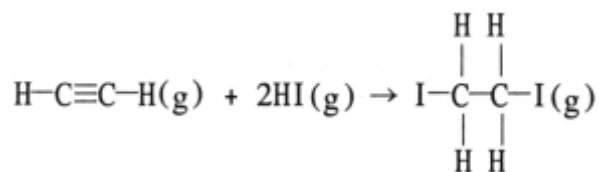
Answer: E

24) In the nitrite ion (NO₂⁻), _____.

- A) both bonds are single bonds
- B) one bond is a double bond and the other is a single bond
- C) there are 20 valence electrons
- D) both bonds are double bonds
- E) both bonds are the same

Answer: E

25) Using the table of average bond energies below, the ΔH for the reaction is _____ kJ.



Bond:	C \equiv C	C-C	H-I	C-I	C-H
D (kJ/mol):	839	348	299	240	413

- A) -63 B) +63 C) +160 D) -160 E) -217

Answer: E