[Q1] Multiple Choice - 1 point

1) The rate of formation of oxygen in the reaction

$$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$$

is 2.28 (mol O_2)·L^{-1}·s^{-1}. What is the rate of formation of NO_2?

- **A.** 0.57 (mol NO_2)·L^{-1}·s^{-1}
- **B.** 9.12 (mol NO_2)·L^{-1}·s^{-1}
- **C.** 2.28 (mol NO_2)·L^{-1}·s^{-1}
- **D.** 1.14 (mol NO_2)·L^{-1}·s^{-1}
- **E.** 4.56 (mol NO_2)·L^{-1}·s^{-1}

Answer: B

[Q2] True False - 1 point

2) For a zero-order reaction, the rate constant has the same units as the rate of reaction. True or false?

Answer

Answer: True

[Q3] Essay - 1 point

3) For the reaction

$$2NO(g) + 2H_2(g) \rightarrow N_2(g) + 2H_2O(g)$$

the following data were collected.

[NO(g)]	[H_2(g)]	Rate (M ·s^{-1})
0.10	0.10	0.0050
0.10	0.20	0.010
0.10	0.30	0.015
0.20	0.10	0.020
0.20	0.20	0.040

What is the rate law for this reaction?

Answer

Answer: rate = $k[H_2][NO]^2$

[Q4] Multiple Choice - 1 point

4) The rate of decomposition of $N_2O_5(g)$ in the reaction

$$2N_2O_5(g) \rightarrow 4NO_2(g) + O_2(g)$$

is 2.89 (mol N_2O_5)·L^{-1}·s^{-1}. What is the rate of formation of NO_2?

- **A.** 11.56 (mol NO_2)·L^{-1}·s^{-1}
- **B.** 1.45 (mol NO_2)·L^{-1}·s^{-1}
- **C.** 5.78 (mol NO_2)·L^{-1}·s^{-1}

Answer: C

[Q5] Multiple Choice - 1 Point

5) Consider the second-order reaction A → B. The concentration of A decreases from 0.95 M to 0.44 M in 11 min. What will be the concentration of A after 21 minutes have elapsed?

- **A.** 0 M
- **B.** 0.22 M
- **C.** 0.30 M
- **D.** 3.38 M

Answer: C

[Q6] Multiple Choice - 1 point

6) A given first-order reaction has a rate constant of 0.00300 s^{-1}. The time required for 85% reaction is

- **A.** 632 s.
- **B.** 23.5 s.
- **C.** 275 s.
- **D.** 316 s.
- **E.** 54.2 s.

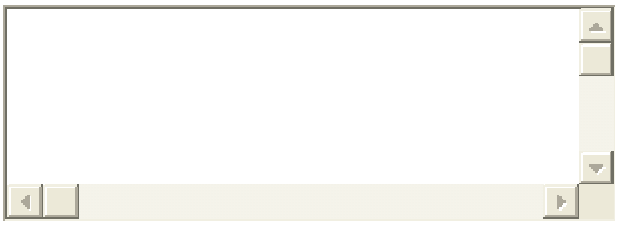
Answer: A

[Q7] Essay - 1 point

7) For the reaction A → products, the following data were collected.

time, *s*	0	1	2	3	4
[A], M	1.00	0.430	0.270	0.200	0.160

Determine the order of the reaction and calculate the rate constant.

Answer 

Answer: second-order, 1.33 $M^{-1} \cdot s^{-1}$

[Q8] Multiple Choice - 1 Point

8) According to the collision theory of gas-phase reactions, a reaction takes place only if the reactant molecules:

a. Collide with a kinetic energy equal to or smaller than a certain maximum energy.
b. Collide with a kinetic energy equal to or greater than a certain minimum energy.
c. Have unpaired electrons.
d. Collide in the correct orientation.

- **A.** b, c, and d
- **B.** b and d
- **C.** a and d
- **D.** b and c

Answer: B

[Q9] Multiple Choice - 1 point

9) All of the following statements with respect to the effect of a catalyst on a reaction are true except:

- **A.** A catalyst has no effect on the equilibrium composition of the reaction.
- **B.** A catalyst provides a lower activation energy for the reaction.
- **C.** When a reaction is catalyzed, both forward and reverse reactions are accelerated.
- **D.** A catalyst speeds up a reaction by providing an alternate pathway for the reaction.
- **E.** When a catalyst speeds up a reaction, the rate law stays the same.

Answer: E

[Q10] Multiple Choice - 1 Point

10) Reaction rates almost always increase with temperature. Why?

- **A.** The collision frequency is greater.
- **B.** The fraction of molecules that collide with a kinetic energy, that is at least equal to a certain minimum value, increases as the temperature is raised.
- **C.** Both A and B are true, but the main reason is that the collision frequency is greater.
- **D.** Both A and B are true, but the main reason is that the fraction of molecules that collide with a

kinetic energy, that is at least equal to a certain minimum value, increases as the temperature is raised.

Answer: D

[Q11] Multiple Choice - 1 Point

11) The rate constant of a given reaction is 0.773 s^{-1} at 320 K and 0.626 s^{-1} at 298 K. Calculate the activation energy of the reaction in kJ/mol.

- **A.** 7602 kJ/mol
- **B.** −7.60 kJ/mol
- **C.** 7.60 kJ/mol
- **D.** 94.3 kJ/mol

Answer: C

[Q12] Multi-part question

12) 13.8.3 (CR) [DIFFICULT] What would be the order of the reaction?

add question to this set

[Heading]
The following mechanism was proposed for the reaction 2 NO(g) ...

[Q1a] Multiple Choice - 1 Point
According to this proposed mechanism, what would be the order ...

[Q1b] Multiple Choice - 1 Point
What is the rate law for the reaction of formation ...

[Q13] Multiple Choice - 1 point

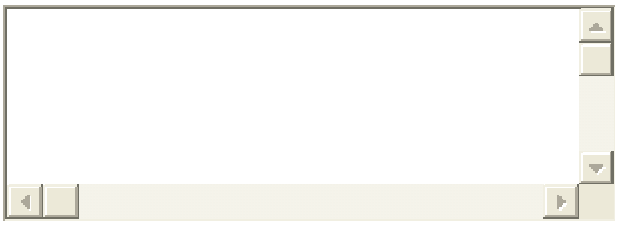
13) An elementary process has an activation energy of 92 kJ/mol. If the enthalpy change for the reaction is –62 kJ/mol, what is the activation energy for the reverse reaction?

- **A.** 154 kJ/mol
- **B.** 62 kJ/mol
- **C.** 92 kJ/mol
- **D.** 30 kJ/mol

Answer: A

[Q14] Essay - 1 point

14) Consider the following mechanism for the destruction of ozone.
$O_3 + NO \rightarrow NO_2 + O_2$
$NO_2 + O \rightarrow NO + O_2$
What is the catalyst in this reaction?

Answer 

Answer: NO_2

[Q15] Multiple Choice - 1 Point

15) Hydrogen is widely considered to be the fuel of our future. Which of the following are the reasons for that?

I. Hydrogen is the most abundant element on Earth.
II. Water is the only combustion product of hydrogen.
III. Hydrogen is the most abundant element in the human body.
IV. Liquid hydrogen has a very low density.
V. Hydrogen has the highest specific enthalpy of any known fuel.
VI. The energy obtained from burning hydrogen is greater than required to release it from its compounds.

- **A.** II, IV and V
- **B.** II, IV, V and VI
- **C.** II and IV
- **D.** I, III and VI

Answer: A

[Q16] Multiple Choice - 1 Point

16) When NaH is added to water, hydrogen gas is produced. What will happen to the water as the reaction proceeds?

- **A.** It will become acidic.
- **B.** A precipitate will form.
- **C.** It will become basic.
- **D.** The pH will decrease.

Answer: C

[Q17] Multiple Choice - 1 Point

17) In what way is magnesium the doorway to life?

- **A.** It is present in every chlorophyll molecule and hence enables photosynthesis to take place.
- **B.** It is the cation in the bones of our skeletons, the shells of shellfish, and the concrete, mortar, and limestone of buildings.

C. Both (a) and (b) are correct.

D. Magnesium is not the "doorway to life" in any way.

Answer: A

[Q18] Multiple Choice - 1 Point

18) Complete the following sentence:
_____ forms covalent bonds; _____ is the most abundant element of group 13/III; _____ has acidic oxides; _____ is an acid.

A. Gallium; boron; aluminum; $Al(OH)_3$

B. Boron; aluminum; boron; $B(OH)_3$

C. Aluminum; aluminum; boron; $Al(OH)_3$

D. Boron; boron; aluminum; $B(OH)_3$

Answer: B

[Q19] Multiple Choice - 1 Point

19) Complete the following sentence:
_____ is the second most abundant element in the Earth's crust; _____ is used mainly in the semiconductor industry; _____ is expensive and not very strong.

A. Silicon; germanium; tin

B. Tin; silicon; lead

C. Lead; silicon; germanium

D. Silicon; tin; tin

Answer: A

[Q20] Multiple Choice - 1 Point

20) Decide whether nitrogen or phosphorus best fits each of the following statements:
(I) It has a larger atomic radius.
(II) Its atoms cannot form π-bonds with each other.
(III) Cannot form more than 4 bonds.

A. (I) nitrogen; (II) nitrogen; (III) phosphorus.

B. (I) phosphorus; (II) phosphorus; (III) nitrogen.

C. (I) phosphorus; (II) phosphorus; (III) phosphorus.

D. (I) nitrogen; (II) nitrogen; (III) nitrogen.

Answer: B

[Q21] Multiple Choice - 1 point

21) In the contact process for the production of sulfuric acid, sulfur is first burned in oxygen to produce $SO_2(g)$. The $SO_2(g)$ is then

- **A.** reduced to $H_2S(g)$.
- **B.** dissolved in water to form oleum.
- **C.** dissolved in water to form $H_2SO_4(aq)$.
- **D.** dissolved in water to form $H_2SO_3(aq)$.
- **E.** oxidized to $SO_3(g)$.

Answer: E

[Q22] Multiple Choice - 1 point

22) The oxoacids of Group 17 have the general formula HXO_n, where X is a halogen and *n* can take on values from 1 through 4. Which of the following is true?

- **A.** As the oxidation number of X increases, the strength of the acid decreases.
- **B.** As the oxidation number of X increases, the oxidizing strength of the acid increases.
- **C.** Only the oxoacids with oxidation number +1 are strong acids.
- **D.** The oxoacids with oxidation number +1 are reducing agents.
- **E.** The oxoacids with oxidation number +7 are weak oxidizing agents.

Answer: B

[Q23] Multiple Choice - 1 point

23) In the Ostwald process, the total change in oxidation number of nitrogen from reactant to nitric acid is

- **A.** 5.
- **B.** 3.
- **C.** 6.
- **D.** 8.
- **E.** 7.

Answer: D

[Q24] Multiple Choice - 1 point

24) All of the following are silicon-oxygen compounds except

- **A.** asbestos.
- **B.** quartz.
- **C.** talc.

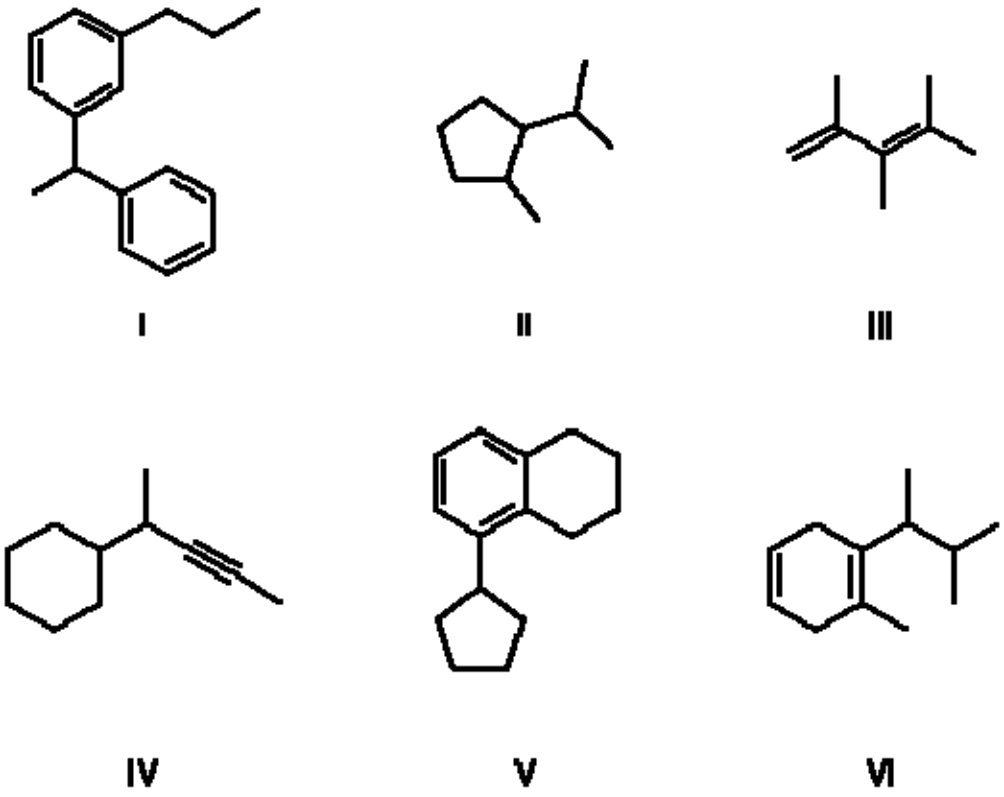
D. diamond.

E. mica.

Answer: D

[Q25] Multiple Choice - 1 Point

25) Identify the hydrocarbons corresponding to the following stick figures as an alkane, an alkene, an alkyne or an aromatic hydrocarbon:



A. I and V aromatic hydrocarbons , II alkane , III and VI alkenes , IV alkyne

B. I , V and VI aromatic hydrocarbons , II alkane , III alkene , IV alkyne

C. I and VI aromatic hydrocarbons , II and V alkanes , III alkene , IV alkyne

D. I and V aromatic hydrocarbons , II and IV alkanes , III and VI alkenes

Answer: A

[Q26] Multiple Choice - 1 Point

26) Give the systematic name of the following compound:

- **A.** 2,4-Dihydroxy-3-hexanol
- **B.** 2,4-Dihydroxy-3-hexanone
- **C.** Ethanol propanol ketone
- **D.** 3,5-Dihydroxy-4-hexanone

Answer: B

[Q27] Multiple Choice - 1 point

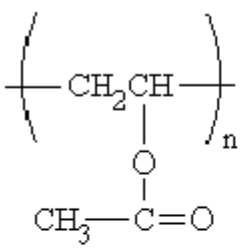
27) The ester $CH_3COO(CH_2)_4CH_3$, which is responsible for the odor of bananas, can be prepared from

- **A.** CH_3CH_2OH and $CH_3(CH_2)_3COOH$.
- **B.** CH_3CHO and $CH_3(CH_2)_3CH_2OH$.
- **C.** CH_3COOH and $CH_3(CH_2)_3CH_2OH$.
- **D.** CH_3CHO and $CH_3(CH_2)_3COOH$.
- **E.** CH_3COOH and $CH_3(CH_2)_3CHO$.

Answer: C

[Q28] Multiple Choice - 1 point

28) Which of the following polymers are addition polymers?



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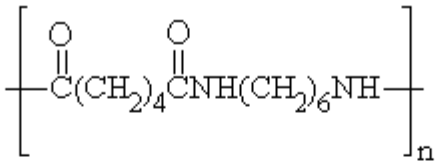

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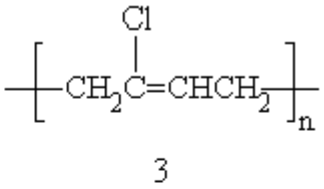

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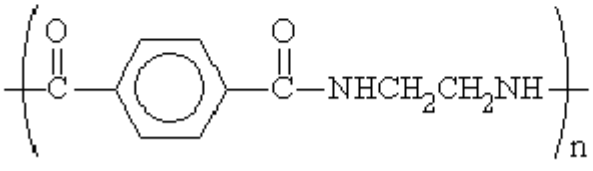

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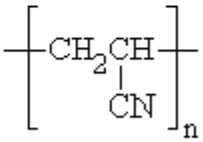

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- **A.** 1, 3, and 5
- **B.** 2 and 3

- **C.** 2 and 4
- **D.** 4 and 5
- **E.** 3 only

Answer: A

[Q29] Multiple Choice - 1 Point

29) Which of the following compounds is not a polysaccharide?

- **A.** wood
- **B.** mollases
- **C.** lard
- **D.** cotton
- **E.** starch

Answer: C

[Q30] Multiple Choice - 1 Point

30) Which statement about fatty acids is not true

- **A.** saturated fatty acids pack more densely in the lining of blood vessels
- **B.** glycerol is used to make both animal fats and vegetable oils
- **C.** unsaturated fatty acids are less flexible that saturated fatty acids
- **D.** the hydrocarbon chains in triglycerides are 18 carbon units long
- **E.** esterification produces a triglyceride from reaction of an alcohol and a carboxylic acid

Answer: D