1. Which molecule has a shape most similar to the NH_3 molecule?

A. GaI_3 B. PBr_3 C. $FeCl_3$ D. $SOCl_2$ E. BF_3

2. Which of the following shows the order in which molecules have an increasing bond angle to the central atom?

A. CH_4, NH_3, H_2O B. NH_3, H_2O, CH_4

C. NH_3, CH_4, H_2O D. H_2O, NH_3, CH_4

E. H_2O, CH_4, NH_3

3. What is the minimum mass in grams of O_2 (M =32 g mol^{-1}) required to burn 1.6 g of CH_4 (M =16 g mol^{-1}) according to the equation below?

4. A partially balanced equation for the conversion of sulfur dioxide to sulfuric acid is given below.

$$\_\_\_SO_2 + \_\_\_H_2 \quad {}_2SO_4$$

Which other species are required to balance the equation, and on which side of the equation do they apO524O524O524O524O524O524O524O524O524Or1 0 0 1 267.53 411.07 Tm0 g0 G[<00320

11. The average bond enthalpy for the C-H bond is 413 kJ mol^{-1}. Which reaction has an enthalpy change closest to this value?

A. CH_4 $+ 2H_2(g)$ B. CH_4 $+ 2H_2(g)$

C. CH_4 $_2(g) + H_2(g)$ D. CH_4 $+ 4H(g)$

E. CH_4 $_3(g) + H(g)$

13. Solutions P, Q, R and S have the following properties:

P: pH = 8 Q: $[H_3O^+] = 1\times10$ mol L^{-1} R: pH = 5 S: $[H_3O^+] = 2\times10$ mol L^{-1}

Which choice shows these in order of increasing acidity (least acidic first)?

A. P,S,R,Q. B. S,P,R,Q C. S,R,P,Q. D. R,P,Q,S. E. Q,R,S,P.

21. How many structural isomers that are not cyclic have the molecular formula C

26. Which compound has the shortest CN bond?

A. CH_3NH_2 B. CH_3CN C. CH_3CHNH

D. $(CH_3)_2CHNH_2$ E. $(CH_3)_3CNH_2$

27. Which row or rows correctly shows a primary, a secondary and a tertiary alcohol?

A. Rows B and D B. Rows A and B C. Rows C and A

D. Row D E. Row B

28. Which statement(s) are correct for metals?

I. They conduct electricity because they have free moving ions

II. They consist of a close-

29. A compound with molar mass M = 102 g mol^{-1} contains 58.8% carbon, 9.80% hydrogen and 31% oxygen by mass. What is its molecular formula?

A. $C_2H_{14}O_4$ B. C_2H_5O C. $C_3H_4O_4$

D. $C_5H_{10}O_2$ E. $C_6H_{14}O$

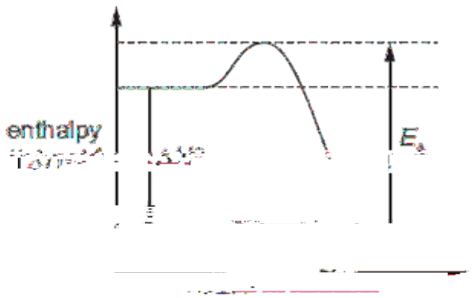
30. Nitric oxide, NO, and bromine vapour react together according to the following equation.

$2NO(g) + Br_2(g) \quad 2NOBr(g) \quad {}_rH^o = \quad ^{-1}$

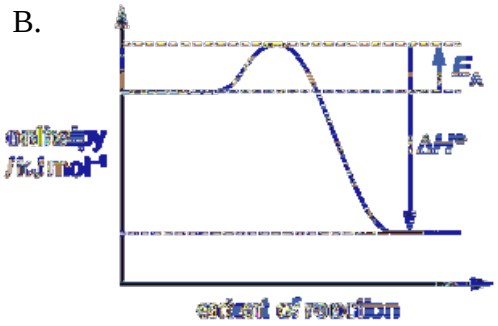
The reaction has an activation energy of +5.4 kJ mol^{-1}.

What is the correct reaction pathway diagram for this reaction?

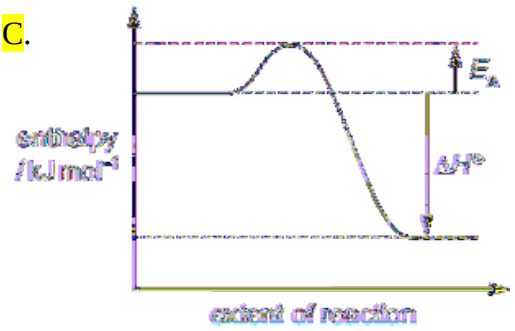
A



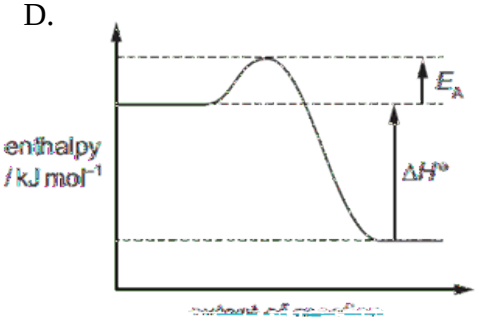
B.



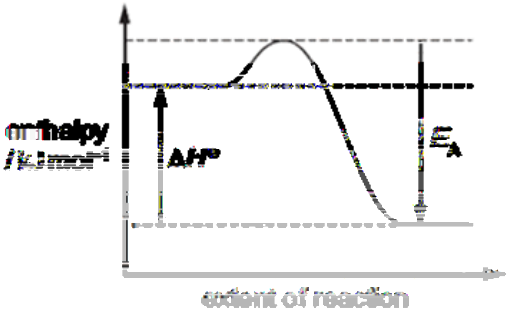
C.



D.



E.



35. For a titration of ammonia $NH_3(aq)$ with HCl(aq), the ammonia must be diluted so that titration of 25.00 mL of the diluted NH_3 requires between 12.00 mL and 25.00 mL of HCl to reach equivalence. A rough titration showed that 1.0 mL of the undiluted NH_3 required 8.5 mL HCl to reach the equivalence point. Which dilution could be used to ensure the titre value is in the required range?

A. 10.00 mL ammonia diluted to 250 mL
B. 10.00 mL ammonia diluted to 500 mL
C. 25.00 mL ammonia diluted to 100 mL
D. 25.00 mL ammonia diluted to 250 mL
E. 25.00 mL ammonia diluted to 500 mL

36. Hexane, $C_6H_{14}(l)$, undergoes complete combustion accordi8u to the followi8u equation.

$$2C_6H_{14}(l) + 19O_2(g) \quad 12CO_2(g) + 14\,H_2O(l) \quad {}_rH^O = \qquad ^{-1}$$

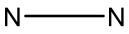
What mass of $C_6H_{14}(l)$ must be reacted to produce 1000 kJ of energy?
$M(C_6H_{14}) = 86.0$ g mol^{-1}

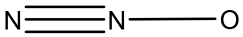
A. 2.07 g B. 10.3 g C. 20.7 g D. 103 g E. 179 g

37. The followi8u reaction is part of the Contact process for production of sulfuric acid.

$$2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g) \qquad K_c = 4.32 \text{ at } 600\ ^oC$$

If $[O_2(g)]$ at equilibrium is 0.150 mol L^{-1} and $[SO_3(g)]$ is 0.250 mol L^{-1}





A. c and d B. b and e C. b, c and e

D. d and a E. c and e