



UNIVERSITY OF GHANA  
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BSC. ENGINEERING  
FIRST SEMESTER EXAMINATIONS: 2016/2017  
SCHOOL OF ENGINEERING SCIENCES  
FAEN 107: GENERAL CHEMISTRY (3 CREDITS)

INSTRUCTIONS:

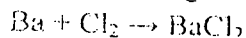
ANSWER SECTION A (OBJECTIVE SETS) AND THREE OTHER QUESTIONS  
FROM SECTION B  
ANSWER SECTIONS A ON THE QUESTION PAPER AND B IN THE ANSWER  
SHEETS PROVIDED

TIME ALLOWED: TWO AND HALF ( $2\frac{1}{2}$ ) HOURS

SECTION A: OBJECTIVE SETS [40 MARKS]

WRITE THE CORRECT ANSWER(S) ON THE QUESTION PAPER AND MAKE SURE  
YOU WRITE YOUR STUDENT ID NUMBER ON THE TOP LEFT CORNER OF YOUR  
QUESTION PAPER

1. Consider the following reaction:



Which of the following statements is true?

- a. The barium atom is losing electrons; therefore, it is oxidized.
- b. The chlorine atom is gaining electrons; therefore, it is oxidized.
- c. The barium atom is gaining electrons; therefore, it is oxidized.
- d. The chlorine atom is losing electrons; therefore, it is reduced.
- e. none of these

2. True or false? Reduction is a gain of electrons.

- a. True
- b. False

3. In the reaction  $2\text{Ca}(s) + \text{O}_2(g) \rightarrow 2\text{CaO}(s)$ , the calcium is

aminer: Abu Yaya (PhD)

Student ID: .....

- a. oxidized
- b. electrolyzed
- c. synthesized
- d. reduced
- e. none of these

4. In the reaction  $2\text{Sr}(s) + \text{Fe}_2\text{Cl}_6(l) \rightarrow 2\text{SrCl}_2(s) + 2\text{FeCl}_3(l)$

- a. reduced
- b. electrolyzed
- c. galvanized
- d. oxidized
- e. none of these

5. The oxidation state of sulfur in  $\text{K}_2\text{SO}_4$  is

- a. +4
- b. +6
- c. +2
- d. -2
- e. 0

6. The oxidation state of chlorine in  $\text{LiClO}_2$  is

- a. -1
- b. +1
- c. 0
- d. -2
- e. +2

7. The oxidation state of carbon in  $\text{CO}_2$  is

- a. 4
- b. +2
- c. 0
- d. -2
- e. -4

8. The oxidation state of sulfur in  $\text{SO}_4^{2-}$  is

- a. 6
- b. 2



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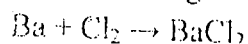
ANSWER SECTIONS A ON THE QUESTION PAPER AND B IN THE ANSWER  
BOOKLETS PROVIDED

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- c 4
- d 0
- e 8

9 The oxidation state of manganese in  $\text{MnO}_4^-$  is

- a 0
- b +3
- c +4
- d +7
- e +8

10. The oxidation state of carbon in  $\text{H}_2\text{CO}_3$  is

- a 1
- b +2
- c 0
- d 0
- e 2

11. True or false? The frequency of the wave is the distance between two consecutive wave peaks.

- a. True
- b. False

12. True or false? The speed of a wave indicates how fast a given peak travels through water.

- a. True
- b. False

13. True or false? The frequency of the wave indicates how many wave peaks pass a certain point per given time period.

- a. True
- b. False

14. True or false? A packet of energy of electromagnetic radiation is called a neutron.

- a. True
- b. False

15. We usually use the term \_\_\_\_\_ for all forms of electromagnetic radiation.

- a. energy

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- b. photons
- c. radiation
- d. light
- e. none of these

16. The form of electromagnetic radiation (EMR) that has more energy per photon than ultraviolet rays but less energy per photon than gamma rays is

- a. microwaves
- b. radio waves
- c. X rays
- d. infrared rays
- e. none of these

17. The form of electromagnetic radiation (EMR) that has less energy per photon than infrared rays but more energy per photon than radio waves is

- a. microwaves
- b. ultraviolet
- c. gamma rays
- d. X rays
- e. none of these

18. Which color of visible light has the most energy per photon?

- a. violet
- b. blue
- c. green
- d. yellow
- e. red

19. Which color of visible light has the least amount of energy per photon?

- a. violet
- b. blue
- c. green
- d. yellow
- e. red

20. When an electron in the ground state absorbs energy, it goes to a(n) \_\_\_\_\_ state.

- a. excited
- b. lower

e. stable

Q B.22/21

$$6.25 \times 10^{-2} \text{ J}$$

C: 1.3264818355640535 J

J 075387387387387395 J

$$e. 3.3221200000000004 \times 10^4 \text{ J}$$

44-38861-10899.kj

27028423772609822 kJ

$$E_{\text{eff}} = 4.7683200000000008 \times 10^{-2} \text{ kJ}$$

83 4 768320000000003.kJ

$$4.1768319999999999 \times 10^4 \text{ kJ}$$

a.  $1368167999999998 \times 10^6 \text{ kal}$

$$6.78154875717017207 \times 10^4 \text{ kcal}$$

C. 78.154875717017205 kcal

d. 327 kcal

$$c. 1.3681679999999998 \times 10^3 \text{ kcal}$$
$$\Delta H = 1.6259024 \times 10^2 \text{ kcal}$$

b. 9.2877629063097515 kcal

$$c. 9.2877629063097498 \times 10^3 \text{ kcal}$$
$$\text{d. } 16.259024 \times 10^{-2} \text{ kcal}$$

e. 0.10766855378281009 kcal

$$a. 5.6274800000000003 \times 10^3 \text{ J}$$

b. 5.6274800000000003 J

$$c. 5.6274800000000003 \times 10^{-3} \text{ J}$$

id. 321.46271510516249 J

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e. 3.1107806691449817 J

26. Perform the indicated conversion:  $7.078999999999999 \text{ kcal} = \underline{\hspace{2cm}} \text{ kJ}$

a. 29.618535999999999 kJ

b. 1.6919216061185467 kJ

c. 0.59104393275886424 kJ

d.  $1.6919216061185469 \times 10^3 \text{ kJ}$

e.  $2.9618535999999995 \times 10^{-2} \text{ kJ}$

27. Perform the indicated conversion:  $2.8700000000000001 \times 10^3 \text{ cal} = \underline{\hspace{2cm}} \text{ J}$

a. 685.9464627151051 J

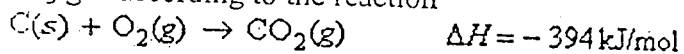
b.  $1.2008080000000001 \times 10^4 \text{ J}$

c. 12.00808 J

d.  $6.859464627151052 \times 10^5 \text{ J}$

e.  $1.4578397212543555 \times 10^{-3} \text{ J}$

28. Determine the enthalpy change when 19.399999999999999 g of carbon is reacted with oxygen according to the reaction



a. 636.43630308076604 kJ

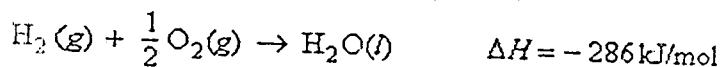
b.  $7.6435999999999993 \times 10^3 \text{ kJ}$

c. -636.43630308076604 kJ

d. -7.6435999999999993 kJ

e. 6.7585012489592007 kJ

29. For the reaction



Calculate the enthalpy change when 4.7300000000000004 g of hydrogen gas is reacted with excess oxygen.

a. -60.465116279069761 kJ

b. 671.02182539682553 kJ

c. -671.02182539682553 kJ

d.  $1.3527800000000003 \times 10^3 \text{ kJ}$

e.  $-1.3527800000000003 \times 10^3 \text{ kJ}$

30. A solution has  $[\text{H}^+] = 5 \times 10^{-8} \text{ M}$ . The pH of this solution is

a. 6.6989700043360187



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- b. 5.981029995663981
  - c. 7.3010299956639813
  - d. 9.7710299956639819
  - e. none of these
31. A solution has  $[H^+] = 4.299999999999998 \times 10^{-8} M$ . The pOH of this solution is
- a. 7.3665315444204138
  - b. 6.6334684555795862
  - c. 9.3734684555795873
  - d. 3.2834684555795861
  - e. none of these
32. Calculate the  $[H^+]$  in a solution that has a pH of 5.54.
- a. 8.46 M
  - b.  $2.88403 \times 10^{-6} M$
  - c. 5.54 M
  - d.  $4.5 \times 10^{-6} M$
  - e. none of these
33. A solution has a pH of 3.1600000000000001. The pOH of this solution is
- a. 3.2600000000000002
  - b. 10.74
  - c. 3.1600000000000001
  - d. 10.84
  - e. none of these
34. A solution has  $[OH^-] = 5 \times 10^{-4} M$ . The pH of this solution is
- a. 3.3010299956639813
  - b.  $1.999999999999998 \times 10^{-11}$
  - c. 5.3494850021680094
  - d. 10.598970004336019
  - e. none of these
35. A solution has a pH of 4.419999999999999. The  $[H^+]$  in this solution is
- a.  $2.6302679918953813 \times 10^{-10} M$
  - b.  $3.8018939632056123 \times 10^{-5} M$

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- c. 9.5800000000000001
- d. 4.4199999999999999
- e. none of these

36. Calculate the  $[H^+]$  in a solution that has a pH of 8.8200000000000003.

- a.  $1.51356 \times 10^{-6} M$
- b.  $4.35 \times 10^{-10} M$
- c.  $2.056 \times 10^{-8} M$
- d.  $3.556 \times 10^{-9} M$
- e. none of these

37. Calculate the  $[OH^-]$  in a solution that has a pH of 3.7599999999999998.

- a.  $3.72 \times 10^{-10} M$
- b.  $5.75 \times 10^{-11} M$
- c.  $6.01 \times 10^{-10} M$
- d.  $7.72 \times 10^{-9} M$
- e. none of these

38. How many moles of pure NaOH must be used to prepare 1.0 L of a solution that has  $pH = 12.26$ ?

- a.  $8.1566068515497552 \times 10^{-16} \text{ mol}$
- b. 0.018197008586099826 mol
- c.  $5.4954087385762476 \times 10^{-13} \text{ mol}$
- d. 1.7400000000000002 mol
- e. none of these

39. Calculate the pH of a 0.044999999999999998 M HCl solution.

- a. 1.2267874862246564
- b. 1.3467874862246563
- c. 12.653212513775344
- d. 12.293212513775345
- e. none of these

40. The amount of energy needed to heat 2.00 g mercury from  $50.0^\circ C$  to  $85^\circ C$  is 9.869999999999992 J. The specific heat capacity of this sample of mercury is

- a.  $0.14099999999999999 \text{ J/g}\cdot^\circ C$
- b.  $0.05805882352941176 \text{ J/g}\cdot^\circ C$

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c.  $0.28199999999999997 \text{ J/g} \cdot ^\circ\text{C}$

d.  $315.44999999999999 \text{ J/g} \cdot ^\circ\text{C}$

e.  $690.89999999999998 \text{ J/g} \cdot ^\circ\text{C}$

[40 Marks]