VISION GROUP

NATIONAL PRIDE • GLOBAL EXCELLENCE

HOME SCHOOLING MATERIAL

PASS A'LEVEL

MATHS, CHEMISTRY

YOUR GUIDE AWAY FROM SCHOOL

ENTREPRENEURSHIP EDUCATION ANSWERS (AENT008)

1. (a) (i) Social entrepreneurship refers to the creation of innovative enterprises to make a positive and sustainable impact on society / environment
while
Sustainable development refers to the development that meets the needs of the present generation without compromising the future generation to meet their needs.

(ii) Traits of social entrepreneurs
- Personal leadership
- Goal-oriented and visionary
- Risk taker
- Advocates
- Hardworking and committed
- Good time managers
- Ethical and principle centred
- Good listeners
- Empowering
- Optimistic and flexible
- Innovative and creative

b) (i) Entrepreneurial culture is a culture that encourages the whole population to take advantage of the abundant opportunities in the environment.

(ii) Objectives of developing entrepreneurial culture
- To acquire formal / informal managerial knowledge and practice in business.
- To link with a wide network of independent family / business contacts.
- To embrace opportunities to practice entrepreneurial competencies.
- To be in contact with numerous familiar successful role models
- To familiarise individuals with small business tasks during youth.
- To tap support from various technical and professional institutions that foster growth of an entrepreneurial spirit.

c) Factors considered when evaluating business ideas:
- Present market
-Costs
-Personal considerations
-Market growth
-Business risks
-Business considerations

(ii) Ways of protecting business ideas:
- Through copyrights
- Using trademarks
- Using patents
- Preserving trade secrets

(d) (i) A mission statement is a brief statement that indicates the overall purpose of the business which is followed up to achieve the objectives of the business.

(ii) Benefits of drafting a mission statement:
- It defines the scope of the business
- It provides a basis for initiating business targets and objectives.
- It gives strategic options to be taken to achieve business goals
- It facilitates communication about the business
- It provides a permanent point of reference during period of change.
- Reminds customers what the business offers
- It brings together internal stakeholders who hold diverse views about the business.

(e) Indicators of an increase in the level of competition:
- Reduction in the daily flow of customers
- Decline in sales
- Reduction in production orders
- Fall in the cash in-flows
- Out-flow of personnel joining more competitive firms
- Inability to access modern technology

SECTION B

2. (a) Positive impact of change:
- It leads to adoption of new technology which increases productivity and service delivery
- Responds to customers' needs
- It leads to acquisition of new leads and innovations
- It determines the direction of the economy
- It challenges the status quo
- It leads to reduction in labour costs due to use of modern technology
- Facilitates exploitation of idle resources within enterprises
- It leads to increased efficiency especially with adoption of new technology

Negative impact of change:
- It leads to increased complexity of methods of production
- It results into job changes and redundancy of many workers especially those who cannot cope with new changes
- It results into geographical relocation of industries and workers
- It leads to extensive reliance on computers information technology which reduces on the number of workers
- It forces employees to acquire new skills or modify the existing competencies
- It is expensive / costly to implement due to training of employees
- Leads to a bad image of the enterprise due to down sizing
- Reduces creativity and innovativeness due to over dependency on computers

NOTE: Impact requires you to give effects of change on business. In your explanation, show how the effect stated is caused/arrived at.

(b) Strategies of coping with change:
- Rewarding success
- Giving explanation as to why change is taking place
- Training employees to cope with change
- Encouraging feedback on progress
- Managing resistance
-Assessing readiness of people involved before implementing change
Note: State by showing the strategies/techniques of coping with change. In your explanation, show how the stated strategy helps business to cope with change.

3. (a) Social – cultural factors that promote entrepreneurial development:
- Supportive cultures / good cultural beliefs
- Presence of social financial support
- Presence of role models
- Existence of social identification
- Supportive religions / favourable religious practices

Political factors that promote entrepreneurial development include:
- Political stability
- Favourable government policies of subsidisation and under taxation
- High government expenditure on education and health
- Strong government departments and institutions.
- Strong and efficient laws
- Positive displacement of political and religious refugees

(b) Salient features of an entrepreneurial environment are:
- Uncertainty. The entrepreneurial environment is unpredictable and keeps on changing periodically hence entrepreneurs need to accommodate the changes / uncertainties as they come by.
- Resource Scarcity: It is characterized by limited resources and this limits the creation of new firms / businesses. Such resources may include: technology, social and financial capital, human resources etc. Entrepreneurs need to thrive within the scarcely supplied resources so as to create successful business.
- Opportunity orientation. The entrepreneurial environment is characterised by opportunities that individuals can make use of so as to operate successfully.
- Flexibility. The entrepreneurial environment is not static but keeps changing. Hence an entrepreneur should not insist on a particular way of doing things especially if it is no longer useful / productive.

4. (a) Reasons for proper inventory management in an enterprise include:
- To avoid tying up a lot of financial investment in inventories
- To avoid overstocking and understocking
- To ensure timely replenishment of raw materials for production of goods
- To meet demand fluctuations and avoid embarrassing and expensive stock outs
- To reduce stock losses due to expiry
- To account for the goods produced or stocked.
- To allow flexibility in production scheduling and marketing.
- To provide a safeguard for variation in raw materials delivery time / lead time
- To maintain timely records of all items and to maintain the stock within the desired limits
- To have an update of records
- To acquire and maintain adequate storage technology.
- To ensure sufficient use of raw materials.
Note: State all points for questions calling for objectives/reasons for starting with (TO, FOR, IN ORDER TO). Explain by showing how the stated objective can be achieved.

(b) Determinants of quality production in an enterprise.
- Quality of raw materials
- Mode of packaging
- Cleanliness of the work place
- Extent to which technical specifications regarding quality are observed
- Extent to which a firm conforms to set legal quality standards
- Quality of labour force
- Nature of technology used
- Mode of storage of the raw materials and finished goods
- Quality of production management, process and layout
- Mode of product distribution
- The level of financial management
Note: For determinants / factors affecting or influencing, state your points using neutral points. Explain by giving two sides (favourable and unfavourable) and showing how or why each side creates high or low quality.

5. (a) Reasons why newspaper advertising is preferred to radio advertising include:
- Newspapers advertising favours the deaf unlike radio advertising where the deaf are disfavored.
- Newspaper advertising is illustrative unlike radio where the message is theoretical.
- Detailed information can be presented using newspapers unlike radio advertising which only broadcasts brief information.
- Newspaper advertisements can be read at any convenient time to the intended people than advertising on radio where the message is timed.
- Newspapers can be kept for review than radio advertising where once a message is missed, there is no chance of review.
- Errors can be corrected on proof-reading a newspaper advert unlike radio adverts where once broadcasting is done errors become hard to correct.
- Newspapers have a wider coverage in terms of geographical area unlike radios where coverage is limited to a small geographical area.
Note: questions of comparing two items require presenting both items in the same point using (unlike, more than, compared to) in between as conjunctions. Where a benefit exists in both, use more than as a conjunction, where a benefit is on the first side only, use unlike as a conjunction.

b) Aims of advertising products include the following:
- To create consumer awareness and stimulate demand for the products
- To increase sales

THE TEACHERS

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ENTREPRENEURSHIP EDUCATION ANSWERS (AENT008)

- To create goodwill for the business and the entrepreneur
- To induce customers to buy a product
- To outcompete rival businesses
- To provide detailed information about the products to customers; e.g., use, quality, e.t.c
- To guide the buyers in selecting a product.
- To provide education to the buyers on how to use, install, store and any other useful information about the product.
- To launch or introduce new products being offered for sale.
- To create customer rapport and acceptance of the product.
- To carry out market research; e.g., finding out customers' comments about the product.
- To monitor and control the buying habits of the customers
- To stabilize sales.

Note: State all points for questions calling for objectives/reasons for starting with (TO, FOR, IN ORDER TO). Explain by showing how the stated objective can be achieved.

6. (a) Causes of differences in wages paid to employees include:
- Difference in workers' experience
- Difference in workers' level of education
- Difference in workers' productivity
- Difference in costs of living
- Difference in demand for service offered by a worker
- Difference in the nature of work done
- Difference in entrepreneurs' capacity to pay
- Difference in working conditions
- Difference in trade unions bargaining power
- Difference in workers' efficiency

Note: Start each point on questions asking for differences with the word, (Difference in). Explain your points by showing the two sides ie the favourable and unfavourable change and how they make some employees to earn higher wages (favourable) and how the unfavourable change makes others to earn lower wages.

b) Methods of paying workers in an enterprise include:
- Piece rate method
- Time rate method
- Overtime pay
- Flat rate payment
- Contract based payment
- Commission payment
- Profit share rate
- Payment in kind
- Shift pay
- Cost of living allowances
- Special wage additions

7. (a) Attributes of a good tax system:
A good tax should be:
- Flexible / buoyant/ elastic
- Convenient
- Certain
- Economical / Cheap / Efficient
- Productive
- Neutral / Impartial
- Comprehensive/diverse
- Should be based on Ability to pay
- Avoid double taxation
- Simple
- Equitable / Fair

Note: For attributes / features / characteristic / traits of taxation, start your points with (It should be….). Explain by showing how the mentioned trait can be exhibited / arrived at / reached by the tax system.

b) Contribution of URA in tax administration include:
- Assessing and collecting taxes in accordance with the tax law.
- Accounting for all tax revenue collected to the ministry responsible for finance.
- Facilitating trade and investment by liaising with other government bodies such as the ministry
- Advising government on matters of policy related to tax and revenue administration.
- Ensuring a well-trained and highly professional human resource to handle tax matters.
- Educating all tax payers and make them aware of their rights and obligations.
- Ensuring secrecy of every tax payer's affairs and using the tax information in accordance with the law.
- Broadening the tax base by bringing different areas of the economy under tax base.

ENTREPRENEURSHIP QUESTIONS (AENT009)

SECTION A: CASE STUDY

1. Read the case study carefully and answer the questions that follow:

Brian Babeyo: Young Statistician Changing "The Face of Uganda's Farming Business"

A fresh graduate from Makerere University with a bachelor's degree in Science in Quantitative Economics, Babeyo is the founder and the Chief Executive Officer (CEO) of Seed Africa. Ent. Ltd, a company he founded in 2014.

Born in Jinja district, Babeyo says he was raised in a middle income family, with both parents earning a living from farming. However, Babeyo didn't want to follow in his parents' footsteps. During his senior six vacation, he took on the streets of Kampala, trying to find what to do for survival, he didn't succeed. As he was planning to go back to Jinja, a friend tipped him about a farming seminar at Nsambya Sharing Hall. He decided to attend the seminar that would later turn to be his turning point in life. In addition to attending seminars, he always listened to radio and TV programs on agriculture, read newspapers and got interested in the success stories of farmers within the region which changed his view on agriculture.

He says he started with an initial capital of Shs600,000 which he raised from his friends and his uncle, Paul. In a space of about four years, his company has grown to have a net worth of over Shs50m. He adds: "I always make surprise visits to my farms to find out the weaknesses of managers and workers. I do this once a week, but I carry some goodies for them in order to inspire them."

Babeyo says apart from growing his company from almost scratch, he is happy to employ fellow youth, providing food to the growing population and play a part in changing people's mindset towards farming.

"I employ more than 20 people with about five managers in the different fields or stages of production," Babeyo says, adding: "My workers and I are like brothers because we do the planning together." Managers are always got from the casual employees at the farm. "I always communicate to my workers on the progress because we are a team and their payment is always prompt to keep them happy."

"My earnings vary with seasons because my ventures are seasonal," he says. Like any other farmer, Babeyo isn't immune to challenges. Currently, he still rents land in various areas which is quite expensive, plus the fake agricultural inputs on market which challenge him. He adds that dry seasons are still a challenge, but he tries to go through it by applying fertilisers and watering/ irrigation where necessary. He adds that price fluctuation is yet another challenge.

Babeyo advises his fellow youth to be go-getters. "Everyone can be successful in any field he or she chooses to specialise in. I think agriculture is the only way to go and anyone can start from wherever they are," he says. To succeed in agribusiness, he says, requires determination, self-belief and sacrifice. He insists it's not about capital.

Questions

a) Explain the sources of business ideas Mr. Babeyo utilised to establish his business.
b) In what ways does Mr. Babeyo motivate his workers on the farm?
c) (i) What challenges does Mr. Babeyo face in running his agricultural enterprise?
(ii) Advise Babeyo on how the above challenges can be solved?
d) What are the benefits of Babeyo's business to the community?

SECTION B: SCHOOL BUSINESS CLUB

2. In relation to your school Business Club Project:
a) State the mission and the vision of the school business club.
b) Prepare the organisational structure for the school business club.
c) Describe the factors that affected the production decisions of the business club.
d) (i) What challenges were faced during the negotiation processes?
(ii) How were the above challenges in d (i) above solved?

SECTION C: FIELD ATTACHMENT/FIELD TRIP

3. In relation to the business you were attached to:
a) Design the plant lay out of the business you were attached to.
b) Explain the factors that influence the choice of technology in the business you were attached to.
c) (i) What hinders effective communication in the business?
(ii) Suggest solutions to hindrances in c (i) above.
d) Describe the various ways the business fosters innovation.

4. For any field trip carried out as an individual or a group:
a) Give the general description of the business visited.
b) Describe the methods used by the business in pricing its products.
c) What are the benefits of training employees in the business visited?
d) Advise the entrepreneur on the importance of investing in collective investment schemes.

MATHEMATICS PAPER ONE QUESTIONS (AMATHS008)

THE TEACHERS

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SECTION A

1. Given that $3 + 2\log_2 x = Log_2 R$ show that $R = 8x^2$
Hence find the roots of the equation
$3 + 2\log_2 x = \log_2(14x - 3)$
2. Solve the equation $5\cos\theta + 2\sin\theta = 3$ for $0 \leq \theta \leq 360$
3. Show that the equation of the plane through point B with position vector $-2i + 4k$ and perpendicular to the vector $i + 3j - 2k$ is $x + 3y - 2z = -10$
4. Find the equations of the tangent and normal to the curve $y = 5x^3 - 2x^2 + 5x - 6$ at the point (1, 1).
5. $\int_0^{\frac{\pi}{2}} \frac{5}{3\sin x + 4\cos x}\,dx$
6. A geometric progression and arithmetic progression have the same first term, the sums of the first, second and third terms are 6, 10.5 and 18 respectively. Calculate the sum of their sixth terms
7. Expand $(1 - 3x)^{\frac{1}{4}}$ in ascending powers as far as the term in x^3
8. Solve the differential equation $(x + 2)^2 \sin y \frac{dy}{dx} + 3 = 0$ given that $y(0) = \frac{\pi}{2}$

MATHEMATICS PAPER ONE QUESTIONS (AMATHS008)

SECTION B

9. (a). Find the equation of the circle passing through the points (-2,-6) (9, 0) and (1,-8).Hence state the Centre and radius of the circle.

(b) A point P(ap^2,$2ap$) is any point on the parabola $y^2 = 4ax$ and a line is joining it through the focus (F) is produced to cut the parabola again at Q. Show that the locus of the mid-point M of P is $y^2=2a(x - a)$

10. (a). Given that $z = \sin\theta - i\cos\theta$. Express $\frac{z+1}{z-1}$ in its simplest form

(b). Show that $2 - 3i$ is a root of the equation $z^4 - 5z^3 + 18z^2 - 17z + 13 = 0$ and find the other roots.

11. (a) Express f(x)= $\frac{5x+3}{(x+2)^2(x^2+2)}$ into partial fraction, hence find $\int f(x)dx$

12. (a) Expand $\left(\frac{1-x}{1+3x}\right)^{\frac{1}{2}}$ up to x^2 and state the value of x for which the expansion is valid.

(b)Find the term independent of x in the binomial expansion of

$$\left(3x^2 + \frac{2}{x}\right)^{10}$$

13. (a) Show that if $y = e^{3x}\sin 2x$ then

$$\frac{d^2y}{dx^2} - 6\frac{dy}{dx} - 13y = o$$

(b) A spherical balloon is inflated such that the rate at which its radius is increasing is 0.8cms^{-1}. Find the rate at which;

i. The volume is increasing at the point when $r = 7.5$cm

ii. Its surface area is increasing when $r = 8$cm

14. (a) Find the position vector of the point of intersection of the lines L_1 and L_2 given that $L_1 = 8\boldsymbol{i} - \boldsymbol{j} + \mu(2\boldsymbol{i} - 6\boldsymbol{j})$ and $L_2 = 4\boldsymbol{i} + 2\boldsymbol{j} + \beta(2\boldsymbol{i} + 5\boldsymbol{j})$

(b) Obtain the equation of a plane through the points A (2, 3, 1) B (3,-1, 4) and C (6, 2, 9)

15. Sketch the curve $y = \frac{(x+2)(x+5)}{2x+3}$

16 (a) Solve the differential equation

$(x+3)\frac{dy}{dx} + 2y = \frac{3}{x+3}$; given that $y = \frac{1}{3}$ and $x = 0$

(b) The size of the population (p) at time (t) satisfies the differential equation

$\frac{dp}{dt} = kp$ Where k is a positive constant.

(i) Show that $p = ce^{kt}$

(ii) If the population was 15,000,000 in 1994 and increased to 24,000,000 in 2004. Estimate what its size will be in the year 2014

CHEMISTRY ANSWERS (ACHEMS008)

1.a)(i) 100g of naphthalene dissolved 1.67g 0f I

1000g of naphthalene will dissolve $\frac{1.67X1000g}{100}$ of I

= 16.7 g of I.

16.7g of I in 1000g of naphthalene cause a depression of 0.848 ^{O}C

127g of I in 1000g of naphthalene cause a depression of $\frac{127X0.848}{16.7}$ ^{O}C

= 6.45 ^{O}C

Thus the freezing point depression of Naphthalene is 6.45 ^{O}C

(ii)

100g of naphthalene dissolved 3.294g 0f S

1000g of naphthalene will dissolve $\frac{3.294X1000g}{100}$ of S

= 32.94 g of S

0.830 ^{O}C depression was caused by 32.94 g of S in 1000g of Naphthalene

6.45 ^{O}C depression will be caused by $\frac{6.45X32.94}{0.830}$ g of S in 1000g of Naphthalene

= 255.9795

= 256 g of S

Thus the molar mass of sulphur is 256g

b) i)R.AM of S = 32

let the number of atoms of S be n

SXn = molar mass

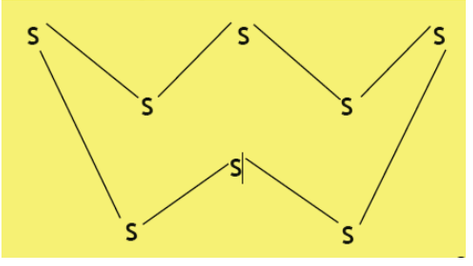
32Xn = 256

n =256/32

n = 8

thus the molecular formula of S is S_8

ii) Structure of sulphur



2 a) i) $HC{\equiv}CH \xrightarrow{CH3Br,Na\text{ in liquid }NH3} CH3C{\equiv}CH$

ii) $CH_4 + H_2O(l) \xrightarrow{Ni,heat(900^oc)}$

iii) $CH_3CH_2CH_2Cl \xrightarrow{Zn\text{-}Cu,\text{ ethanol reflux}} CH_3CH_2CH_3$

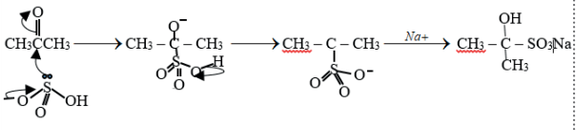
iv)

$$CH_3COCH_3 \xrightarrow{NaHSO3} CH3 - \underset{CH_3}{\overset{OH}{C}} - SO_3Na$$

$$CH_3COCH_3 \xrightarrow{NaHSO3} CH3 - \underset{CH_3}{\overset{OH}{C}} - SO_3Na$$

b) Mechanism:

$$NaHSO_3 \longrightarrow Na^+ + HSO_3^-$$



3. a) 1. Carbon forms oxides which are in gaseous state at room temperature, other elements form solid oxides.

2. Carbon is capable of catenation while other elements cannot.

3. Carbon can combine with almost all elements to form fairly stable compounds, other group (IV) elements cannot combine with many elements.

b

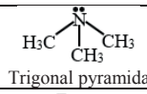
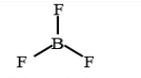
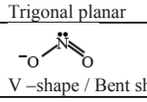
i) $C(s) + 2H_2SO_4(l) \longrightarrow CO_2(g) + 2SO_2(g) + 2H_2O(l)$

ii) $Sn(s) + 2H_2SO_4(l) \longrightarrow Sn(SO_4)_2 + 2SO_2(g) + 4H_2O(l)$

4. a) Hydrogen fluoride is a weaker acid than hydrogen chloride because fluorine being more electronegative than chlorine, the hydrogen-fluoride bond is stronger than hydrogen-chlorine bond so hydrogen-chloride partially ionises in aqueous solution releasing fewer hydrogen ions in solution than hydrogen-chloride which is completely ionised.

b) $K_{HF} = 3.15 \times 10^{-3}n^{-1}$, c = 0.1moldm^{-3}

5.a)

$(CH_3)_3N$	 Trigonal pyramidal
BF_3	 Trigonal planar
NO_2^-	 V –shape / Bent shape

b (i) $(CH_3)_3N + BF_3 \longrightarrow (CH_3)_3N - BF_3$

(ii)

$2MnO_4^-(aq) + 6H^+(aq) + 5NO_2^-(aq) \longrightarrow 2Mn^{2+}(aq) + 3H_2O(l) + 5NO_3^-(aq)$

6 (a) i) $^{238}U + {}^{1}n \longrightarrow {}^{237}Pu +$ gamma rays

ii) $^{241}_{95}Am + {}^{4}_{2}He \longrightarrow {}^{243}_{97} + 2{}^{1}_{0}n$ neutron

iii) $^{27}_{14}Si \longrightarrow {}^{27}_{13}Al + {}^{0}_{-1}\beta$ beta particle

(b) let the original mass be No

decrease in mass = $\frac{32}{100}$ No

remaining mass Nt = No - $\frac{32}{100}$ No = $\frac{68}{100}$ No

$$\ln\left(\frac{No}{Nt}\right) = \lambda t$$

$$\ln\left(\frac{No}{\frac{68}{100}No}\right) = \lambda \times 40$$

$$\ln\left(\frac{100}{68}\right) = 40\lambda$$

$0.38566 = 40\lambda$

$\lambda = 9.642\times10^{-3}$day^{-1}

but $t_{½} = \frac{0.693}{\lambda}$

$t_{½} = \frac{0.693}{9.642\times10^{-3}}$

$t_{½}$ = 7.2 days

7. a) Maximum yield of sulphur trioxide occurs at:

1. High pressure of about 9 atmospheres
2. Low pressure of about 450 – 500°c
3. Vanadium pentaoxide catalyst

b) i) $SO_3(g) + H_2SO_4(l) \longrightarrow H_2S_2O_7(l)$

$H_2S_2O_7(l) + H_2O(l) \longrightarrow 2H_2SO_4(aq)$

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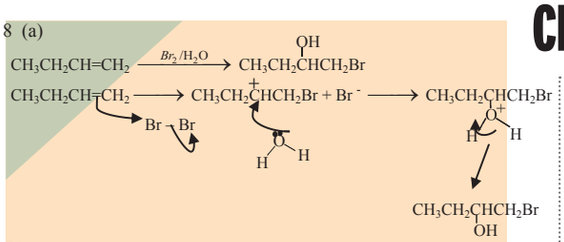
Tuesday, July 14, 2020

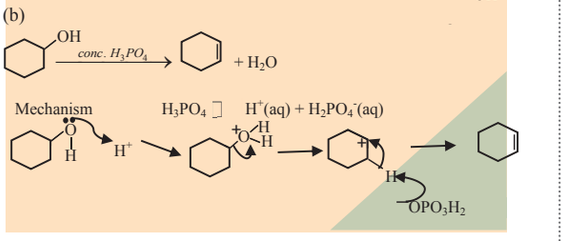
PASS A'LEVEL

CHEMISTRY ANSWERS (ACHEMS008)

8 (a)



(b)

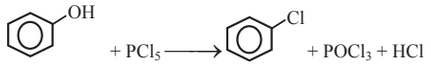


9. a) Melting points generally decrease from Be to Ba because the atomic radii decreases from Be to Ba causing the electron charge density to decrease hence decrease in the strength of metallic bonds consequently the amount of heat energy required to break the bond decreases.

b) The melting point of calcium is higher than that of magnesium because calcium adopts hexagonal/close packed structure. This enhances attraction of atoms and hence strength of metallic bonds. Other members including magnesium adopts a body centred cubic structure in which the atoms are not closely packed hence weaker metallic bonds. Consequently more heat energy is required to break the stronger metallic bonds in calcium than magnesium.

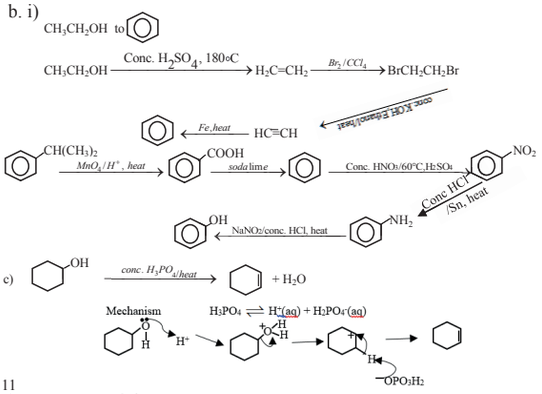
SECTION B

10. a) Both ethanol and phenol react with phosphorous pentachloride to form hydrogen chloride gas. Chloro ethane is formed in case of ethanol while chloro-benzene is formed in case of phenol.



Ethanol is more reactive than phenol.

b. i)



c)

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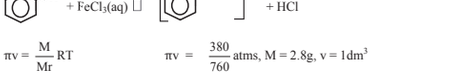
a) orange solution turns to green
A yellow precipitate is formed and effervescence of a colourless gas.

b) $Na_2S_2O_3(aq) + 2Cl_2 + H_2O(l) \longrightarrow 2HOCl(aq) + 2NaCl(aq) + SO_2(g) + S(s)$

c) A colourless solution turns brown to brown

$S_2O_4^{2-}(aq) + 2I^-(aq) \longrightarrow 2SO_4^{2-}(aq) + I_2(g)$

d) A violet solution is formed



12.

a) $\pi v = \frac{M}{Mr}RT$ $\quad \pi v = \frac{380}{760}$ atms, M = 2.8g, v = 1dm^3

$\frac{380}{760} \times 1 = \frac{2.8}{Mr \times 0.0821 \times 273}$; $\quad Mr = \frac{2.8 \times 0.0821 \times 273 \times 760}{380}$ **Mr = 1255**

b) i) Mass of carbon dioxide = $\left(\frac{5.04}{22.4} x 44\right)$ g

mass of C in CO_2 = $\left(\frac{12}{44} x \frac{5.04}{224} x 44\right) = 2.7g$

mass of hydrogen in $H_2O = \left(\frac{2}{18} x 2.7\right) = 0.3g$

mass of Oxygen in sample = 3.4 - (2.7 + 0.3) = 0.4g

	C	H	O
	2.7	0.3	0.4
	$\frac{2.7}{12}$	$\frac{0.3}{1}$	$\frac{0.4}{16}$
	0.225	0.3	0.025
	$\frac{0.225}{0.025}$	$\frac{0.3}{0.025}$	$\frac{0.025}{0.025}$
	9	12	1

The empirical formula is $C_9H_{12}O$

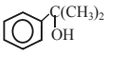
ii) $(C_9H_{12}O)n = 125.5$

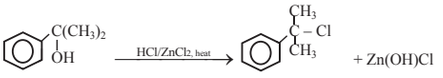
$(12x9n)+(1x12n)+(16x1n) = 125.5$

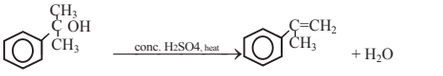
$n = 1$

molecular formula is $C_9H_{12}O$.

c

i) R is  2-Phenylpropan-2-ol

ii) 

iii) 

13 a) An acid-base indicator is an organic base or acid which changes colour according to change in pH of the solution.

b) Let the molecular formula of phenolphthalein be HPh, Phenolphthalein is a weak acid which ionises as

$HPh \longrightarrow H^+(aq) + Ph^-(aq)$

In acid medium, the concentration of the hydrogen ions is so high that the equilibrium lies more on the left hence the colour of the ionised indicator (colourless) dominates. In alkaline medium, the hydroxyl ions react with the hydrogen ion such that the equilibrium shifts and lies more on the right. So the colour of the anion of the indicator (pink or purple) dominates.

c) Aqueous solution of sodium carbonate has a pH slightly above seven because the carbonate ion in sodium carbonate is a stronger base than water so it obstructs a proton from a water molecule thereby releasing hydroxide ions on hydrolysis. This makes the solution slightly alkaline hence pH above 7.

d $CO_3^{2-}(aq) + H_2O(l) \rightleftharpoons H_2CO_3(aq) + 2OH^-(aq)$

i) Volume of acid that reacted with Na_2CO_3 only
$= 2(36.5 - 22.5) = 28cm^3$

Volume of acid that reacted with NaOH only
$= 36.5 - 28 = 8.5\ cm^3$

$1000cm^3$ of solution contain 0.1 moles of HCl

$8.5cm^3$ of solution contain $\left(\frac{0.1x8.5}{1000}\right)$ moles of HCl

$= 8.5 \times 10^{-4}$moles

$NaOH(aq) + HCl(aq) \longrightarrow NaCl(aq) + H_2O(l)$

from equation mole ratio is 1:1; therefore moles of NaOH = 8

$25cm^3$ of solution contain 8.5×10^{-4}molesof NaOH

$1000cm^3$ of solution contain $\frac{8.5 \times 10^{-4} x 1000}{25}$ moles NaOH

$= \mathbf{3.4 \times 10^{-2} moldm^{-3}}$

Rfm of NaOH = 40

mass of NaOH = 3.4×10^{-2} x 40 = 1.36g/l

ii) $1000cm^3$ of solution contain 0.1moles of HCl

$28cm^3$ of solution contain $\left(\frac{0.1x28}{1000}\right)$ moles of HCl

$Na_2CO_3(aq) + 2HCl(aq) \longrightarrow NaCl(aq) + H_2O(l) + CO_2(g)$

mole ratio; carbonate to acid is 1:2

moles of $Na_2CO_3 = \frac{1}{2}\left(\frac{0.1x28}{1000}\right)$

$25cm^3$ of solution contain $\frac{1}{2}\left(\frac{0.1x28}{1000}\right)$ moles of sodium carbonate

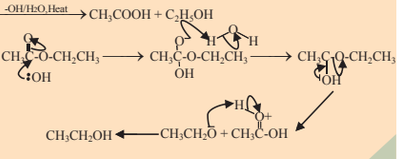
$1000cm^3$ of solution contain $\frac{1}{2}\left(\frac{0.1x28x100}{1000x25}\right) = 0.056$ moldm^{-3}

Rfm of $Na_2CO_3 = 106$

mass of $Na_2CO_3 = 106x0.056 =$ **5.936g/l**

$CH_3CO_2C_2H_5(l) \xrightarrow{-OH/H_2O, Heat} CH_3COOH + C_2H_5OH$

Mechanism:



b) When the concentration of $CH_3CO_2C_2H_5$ and -OH is concurrently doubled, the initial rate of the reaction remains unchanged but in experiment 2 and 3 if the [-OH] is kept constant but that of $CH_3CO_2C_2H_5$ halved, the rate of reaction halves also. So the reaction is zero order with respect to hydroxyl ions since rate is independent of its concentration.

15 a) Generally ionisation energy decreases in the order $4^{th} > 3^{rd} > 2^{nd} > 1^{st}$. this is because after removal of the first electron or subsequent electron, the number of become greater.

b) Element belongs to group I because there is a big energy change between the first and the second energy levels. This means that the electrons are removed from principle energy level.

c) $\epsilon = h$ f

$= \frac{6.626 \times 10^{-34} \times 3 \times 10^{8}}{242} = 3.25 \times 10^{-7}$

$\epsilon = \mathbf{6.023\ X10^{23} \times 3.25 \times 10^{-7}}$

16. a) i) The cation is Mn^{2+}

ii) $2Mn^{2+}(aq) + 5PbO_2(s) + 4H^+(aq) \longrightarrow 2MnO_4^-(aq) + 2H_2O(l) + 5Pb^{2+}(aq)$

b) A white precipitate was formed.

$Mn^{2+}(aq) + CO_3^{2-}(aq) \longrightarrow MnCO_3(s)$

c) i)

element	Mn	N	O
	37.4	19	43.6
	$\frac{37.5}{55}$	$\frac{19}{14}$	$\frac{43.6}{16}$
	0.68	1.357	2.875
	$\frac{0.68}{0.68}$	$\frac{1.357}{0.68}$	$\frac{2.875}{0.68}$
	1	2	4

The empirical formula of K is MnN_2O_4

ii) 0.127°C is the freezing point depression caused by 10g of K

1.86°C is the freezing point depression caused by $\left(\frac{10x1.86}{0.127}\right)g$

$= 146.4$

$(MnN_2O_4)n = 146.4$

$55n+(2x14n)+(16x4n) = 146.4$

$n = 1$

the molecular formula of K = **$Mn(NO_2)_2$**

17. a) Reagent: dilute sulphuric acid
CrO_4^{2-}: yellow solution turns to orange
$Cr_2O_7^{2-}$: no observable change

b) Reagent: dilute hydrochloric acid
SO_3^{2-}: Effervescence of a colourless gas
$S_2O_3^{2-}$: Yellow precipitate with effervescence

c) Reagent: hot acidified potassium manganate VII solution
$C_2O_4^{2-}$: purple solution turns to colourless
CH_3COO: No observable change

CHEMISTRY QUESTIONS (ACHEMS009)

THE TEACHERS

MOSES MUGOGO,
SEETA HIGH SCHOOL

ANDREW HANNINGTON NSEREKO
BISHOP'S SENIOR SCHOOL - MUKONO

1) (a) Define the term freezing point constant.

(b) 0.4g of $K_3Fe(CN)_6$ was dissolved in $10cm^3$ of water. (K_b for water = $1.86^0C\ mol^{-1}kg^{-1}$)

(i) Calculate the freezing point of the solution.

(ii) The actual observed freezing point is -0.9040C. Explain the difference in the observed and the calculated freezing point.

(c) The vapour pressures at various temperatures for benzene and a solution containing 1.86g of an organic acid in 10g of benzene are given in the table below;

Temp/^{0}C	72	74	76	78	80	82
V.P of benzene (atm)	0.30	0.42	0.56	0.75	1.0	1.2
V.P of solution (atm)	0.10	0.20	0.31	0.43	0.56	0.76

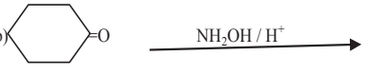
(i) Plot a graph of vapour pressure against temperature for benzene and the solution using the same axes.
(ii) Use your graph to calculate the relative molecular mass of the organic acid. (K_b for benzene = $2.57\ mol^{-1}kg^{-1}$)

(d) (i) Explain what is meant by the term steam distillation.

(ii) When a compound Y was steam distilled at standard atmospheric pressure, the temperature of distillation was 96oC. The vapour pressure of water at this temperature was 730mmHg and the distillate contained 74% of water. Calculate the relative molecular mass of compound Y.

(2) complete the following organic reaction mechanisms and outline the reaction mechanism;

(a) 

(b) 

(c) CH_3CONH_2 $\xrightarrow[\text{Heat}]{H_2O\ /\ H^+}$

(d) CH_3  $+ CH_3CH_2Br$ $\xrightarrow[\text{Heat}]{OH^-_{(aq)}}$

(e) $CH_3CHO + H_2N\text{-}COCH_2NH_2$ $\xrightarrow{H^+}$

(3) Explain the following observations.
(a) The order of acidity of the halogens increases in order.

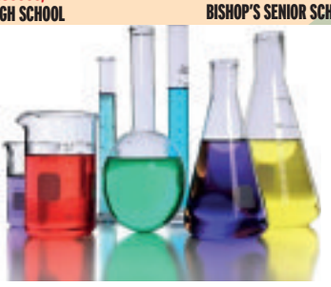
$$HI > HBr > HCl > HF$$

b) Although ionisation energy generally increases across a period in the periodic table, the first ionization energy of boron is less than that of beryllium.

(c) A mixture of water (boiling point 100^0 C) and amino benzene (boiling point 184^0 C) boils at 98^0 C at 1 atmospheric pressure.

d) An aqueous solution of chromium (III) chloride is acidic to litmus.

e) Beryllium is in group (II) of the periodic table. But its properties resemble those of aluminium which is in group (III) of the periodic table.



(f) When propene is reacted with bromine in presence of sodium chloride bromochloropropane as well as 1,2-dibropropane are formed.

(4) (a) The elements fluorine, chlorine, bromine and iodine are in group(VII) of the Periodic table.

(i) State the physical state in which each of the above given elements exists at room temperature.

(ii) Explain your answer in (a) i above

(b) Discuss the reactions of the elements fluorine, chlorine, bromine and iodine with;
(i) Water
(ii) Sodium hydroxide

(c) How would you distinguish between potassium bromide and potassium iodine given chlorine water and tetra chloromethane.

SECTION B

5. (a) Describe the reaction of methyl benzene with chlorine.

(b) Outline reaction mechanism for one of the reactions involved in (a) above.

(c) Explain briefly each of the following observations.
(i) Methylchlorobenzene forms a white precipitate when reacted with hot sodium hydroxide solution, dilute nitric acid and silver nitrate solution whereas no observable change occurs with chlorobenzene.
(ii) Both cyclohexene and benzene react with bromine however only cyclohexene reacts with potassium permanganate solution
(iii) Aqueous solution of phenol has a pH less than7.

(6) (a) (i) State the two possible oxidation states of group(IV) elements.
(ii) State and explain how the above two mentioned oxidation states vary within the group.

(b) Compare the reactions of beryllium and lead with;
(i) water
(ii) sodium hydroxide

(c) State the conditions and write equation for the reaction to show how the following compounds can be prepared.
(i) Tin(IV)chloride
(ii) Tin(IV)oxide

(d) When water is added to silicon(IV)chloride a white solid and white fumes are formed however no observable change occurs when water is added to carbon tetrachloride. Explain.

(7) (a) (i) Explain what is meant by the term conductivity.

(ii) State any two factors that influence magnitude of conductivity of an electrolyte.

(b) Explain what is meant by each of the following ter ms;
(i) weak electrolyte
(ii) strong electrolyte

(c) On the same graph draw sketch curves that show the variation in conductivity against concentration for ;
(i) Hydrochloric acid
(ii) Hypochlorous acid

d) Explain the shapes of the graphs in (c) above.

(e) (i) State kohlrausch's law of independent migration of ions and state its application
(ii) Calculate the molar conductivity at infinite dilution at 25^0C of ethanoic acid, given that the molar conductivities at infinite dilution of hydrochloric acid , sodium chloride and sodium ethanoate are 4.26×10^{-2} , 1.26×10^{-2} and 9.1×10^{-3} $ohm^{-1}m^2mol^{-1}$ respectively.

(8) During the extraction of aluminium from bauxite, the ore is first heated, powdered and then the powdered material is heated with sodium hydroxide solution and finally filtered.

(a) State why the;
(i) Ore is first heated before changing it to the powder.
(ii) Powdered ore is heated with sodium hydroxide solution and then filtered.

(b) Write equation for the reaction between the powdered ore and sodium hydroxide solution.

(c) Briefly describe how pure aluminium can be obtained from the products from the reaction in (b) above. (Your answer should include equations)

(d)
Write equations for the reaction between aluminium and;
(i) Fe2O3(s).
(ii) Mn3O4(s).
(iii) Cr2O3(s

(e) Use equations to show how anhydrous aluminium chloride can be prepared.

(f) When magnesium powder is added to aqueous solution of aluminium chloride a white precipitate and bubbles of colourless gas is given off. Explain this observation.

Answers and more questions next Tuesday

Write to us:
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