VISION GROUP

NATIONAL PRIDE • GLOBAL EXCELLENCE

HOME SCHOOLING MATERIAL

PASS A' LEVEL

CHEMISTRY, MATHEMATICS & ENTREPRENEURSHIP

PASS O'LEVEL

YOUR GUIDE AWAY FROM SCHOOL

ENTREPRENEURSHIP EDUCATION ANSWERS (AENT005)

1. (a) Quality refers to a product's ability to meet customer needs and requirements
OR fitness for use and performance to requirements
OR performance of a product in relation to the consumer's needs
OR a measure of customer satisfaction into a product over its life time.

(ii) Techniques used by entrepreneurs to ensure quality in production (use present continuous tense)
- Using proper distribution channel
- Using quality raw materials
- Carrying out market research
- Using good and beautiful packaging materials
- Using good storage facilities
- Monitoring and supervision of workers
- Training of workers
- Giving clear instructions to workers
- Employing skilled workers
- Encouraging specialisation/division of labor
- Using better production methords/technology
- Observing technical specifications concerning quality.

(b) Utilities used by business enterprises
- Water
- Electricity/Power
- Communication services
- Transport services
- Security Services
- Warehousing services
- Insurance services
- Advertising services
- Banking services
- Education/ Training services

(c) (i) Innovation refers to the way of transforming resources of an enterprise through creativity of people into new resources and wealth OR it is the ability to apply creative solutions to problems and challenges to improve people's lives.

(ii) Sources of innovation
- Unexpected occurrences/events
- Demographic changes
- Shifts in people's perception about the product
- Introduction of new knowledge
- Process needs to fill missing links in production process
- Incongruities which result from differences in business perception and reality
- Industry and market changes/shifts

d(i) Personal branding refers to a process of developing a mark to express and communicate your skills, personality and value OR is a practice of people/business/organisations marketing themselves/ careers as brands

(ii) Principles of personal branding
- Unity (reflects togetherness)
- Endurance/patience
- Specialisation (reflects single/core strengths)
- Leadership
- Distinctiveness /uniqueness
- Visibility
- Goodwill (yields good results and endures longer)

(e) Key players in capital markets
- Capital Market Authority
- Uganda Securities Exchange
- Brokers/dealers
- Stoke jobbers
- Investment advisers
- Fund manager
- Custodians
- Registrar
- Shareholders

SECTION B

2(a). Explaining users of a business plan (state the point, explain by showing how the given stakeholder uses the business plan).
- Government
- Entrepreneur
- Employees/workers
- Suppliers
- Financiers (bankers, investors, donors)

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- Regulatory authorities/bodies
- Customers
- Managers

(b) Explaining factors considered when preparing a marketing plan (state a neutral/non-biased point. Give a consideration /choice in an explanation)
- Terms and conditions for selling
- Sales personnel recruitment plan
- Sales target/projected sales
- Sales promotion and advertising strategies
- Projected marketing expenses
- Distribution strategies
- Target customers
- Products offer/Nature
- Pricing strategies
- Position of competitors

E.g., Terms and conditions for selling. An entrepreneur considers whether to sell on cash basis, credit or installment selling.

3(a). Monitoring tools used by entrepreneurs in business include; (state the tool/answer, Explanation may either be the definition of the tool, its importance/purpose/objective etc. of preparing it, how it is used, etc.)
- Sales target
- Production target
- Departmental records
- Books of accounts
- Balance sheet
- Work schedules/organisation of work
- Operational budget
- Stock records/cards
- Cash flow plan

E.g., Operational budget. It is a summary of income and expense projections over a period of time. (Explanation by definition) OR Operational budget. It enables entrepreneurs to calculate cost of goods sold in a given period of time (explanation by importance)

(b) Explaining need for proper business monitoring
Points may be stated as present continuous tense using to, in order to or for.
- To minimise time wastage by workers while at work
- To ensure production of high quality products e.g. by following set standards.
- To meet customer orders in time
- To Evaluation of worker's performance in relation to the set target
- To find out how much and from where the business gets cash
- To check the financial position of the business at a particular time
- Following up the materials issued/received and taken out of business stores
- For comparing the profits realised with the estimated or planned profits
- For calculating profits or losses suffered by a business in a given time
- To assess whether all business departments are achieving their targets
- For effective planning of production process
- For keeping records of actual periodical sales on production to compare the set targets
- To measure achievements of managerial through the use of a business plan
- Showing organisation transactions with financiers e.g. banks
- To find out the extent to which business targets are being met.

4(a) Justifying the need for charging taxes by the government
- To generate revenue to the government
- Reducing income inequality
- Protection of infant domestic industries
- To make citizens responsible after contributing to the economy
- Improvement of balance of payment by discouraging imports.
- To encourage savings by reducing disposable income.
- Recovering community wealth e.g. inheritance tax
- Creation of employment
- To check/control inflation
- To encourage production of desirable goods and services.
- Regulating exploitation/controlling over-exploitation of goods
- Regulation of monopoly powers of business.
- Encouraging hard work
- To restrict consumption of harmful products
- Reduction of dumping in a country
- Providing a way of charging those who use government facilities

(b) Techniques used by government to increase taxable capacity (state points using present continuous tense /by or through, etc.)
- Ensuring political stability /peace
- Improvement of infrastructure
- By reviewing the existing tax laws
- Through punishing corrupt officials
- Setting up anti-smuggling units
- Taking up intensive education / training/mass sensitisation
- Empowering/improvement of tax administration
- Controlling population growth to reduce dependency ratios
- Introducing new taxes in the country
- Encouraging industrialization to increase employment.
- Manpower planning and development to reduce unemployment
- Introducing and empowering tax authorities
- Increasing peoples incomes e.g. by creating more jobs
- Encouraging/supporting commercial agriculture

5(a) Insurance policies that a large scale business may take up
- Whole life policy (compensation paid after death)
- Endowment policy
- Life annuity
- Glass insurance policy
- Fidelity guarantee policy
- Group life policy
- Sickness policy
- Fire insurance policy
- Theft and burglary policy
- Loss of profits policy
- Money at promises or on transit policy
- Motor insurance policy
- Aviation policy
- Marine insurance policy
- Machinery breakdown and consequential loss policy
- Employers liability policy
- Multi-purpose policy (covers several policies under a single policy)

NB: State the point clearly. Explanation is got from what it covers. All points must reflect the word policy as a key word.

(b) Conditions under which an insurance policy may be terminated/ state the point using in case, if, when.
- In case of destruction of the subject matter
- When the insured over declares or under declares the insured property
- In case of failure to pay premium/breach of contract
- In case the insured insures the property in which he has no insurable interest
- If the insured had been compensated
- If the contract has expired
- In case of operation of law

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ANSWERS (AENT005)

- In case of frustration; e.g., death/ insanity
- In case of agreement between the insured and the insurer

6(a). Limitations to women active participation in business (points to be stated as negatively based)
- Limited role models
- Limited access to finance by women
- Poor parent perception about girl child
- Discrimination in the labour market
- Negative media influence on women
- Limited child care facilities
- Early marriages
- Unfavourable conditional practices
- Negative women attitude towards entrepreneurship
- High levels of domestic violence
- High risk occupations that disfavour women
- Limited access to training
- Low levels of education
- Double demands on girl child/women
- Limited household contribution of the partner
- Unfavourable government policy about women
- Negative colonial influence about women
- Lack of career guidance to women.

b). How the government can encourage women participation in business
- Encouraging use of family planning
- Sensitisation /educating/training women on entrepreneurship
- Provision of equal education opportunities to women and men
- Providing financial support to women
- Provision of free education to all
- Encouraging entrepreneurship education at all levels
- By providing child care facilities
- Through Recognising successful women entrepreneurs
- Publishing literature/ writing about important women entrepreneurs
- Ensuring effective communication in all dealings
- Ensuring political stability
- Setting gender laws that promote gender balance
- Establishing premises that give all members a sense of identity and belonging to the business

7(a). Explain the differences between social enterprises and business enterprises (two points to appear in one paragraph joined by words like as compared to, unlike, while , whereas, yet, but etc.)
- Social enterprises refer to innovative enterprises created to make a positive and sustainable impact on society while business enterprises refer to organisations engaged in trade of products with the aim of making profits to increase the wealth of their owners
- In social enterprises the end goal is sustainable impact while in business enterprises the end goal is profit maximization
- In social enterprises one seeks to achieve long term results unlike in business enterprises one aims at short term/immediate results.
- In social enterprises it is a combination of nonprofits for profits and hybrid as compared to business enterprises which are purely for profits.
- In social enterprises there is social and environmental benefits for communities while in business enterprises there is profit or money returns for private investors
- Social enterprises aim at servicing the vulnerable/disadvantaged while business enterprises aim at targeting to serve on potential customers
- In social enterprises there is empowerment of partners in development while business enterprises offer superior services that meet consumer needs
- In social enterprises the impact is social, environmental and economic development as compared to business enterprises the impact is production of new products

N.B: In writing down the point, clearly state the concepts. Let the order of the question be followed when stating the points)

(b) Elements of a social enterprise plan
- Introduction shows title, vision statement and summary of the enterprise.
- Theory of change. Explain the vision and impact.
- The opportunity — identify impact area, current reality etc.
- Innovation — includes root cause analysis etc.
- Management innovations, outlines management roles and responsibilities
- Sustainability — includes budget, start-up funding strategies, profit management, etc.

NOTE:
- Clearly state the point and separate it from the explanation.
- Spelling of key words is very important.

ENTREPRENEURSHIP EDUCATION QUESTIONS (AENT005)

SECTION A: CASE STUDY

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

Mr. and Mrs. Pipeline operate a salon in Banda market, on Jinja Road, Kampala. There are many other salons in the market and the competition is very high. Mr. and Mrs. Pipeline are very hard working; they are always at their salon by 6:00am every day. They have specialized in hair styles like French cut, shaolin, back bus, American cut, groove, baloteli styles, marine etc. to serve their customers satisfactorily. They also provide other services like nail cutting, makeup and massage, customers are also given newspapers to read, a TV to watch various programmes and a bottle of soda.

While Mr. Pipeline strategically stands outside the salon to welcome his customers, Mrs. Pipeline gives them seats, takes their orders and ensures that barbers serve them promptly. After their service Mrs. Pipeline collects payments. Customers leave after catching up with the latest news from different parts of Uganda which Mr. Pipeline always has a farewell and come-back request. Mr. Pipeline always rings in the minds of the customers every time they think about cutting hair in Banda.

The Pipeline's salon is always full of happy customers. The Pipelines know their customers by name, their favorite services. There is never a day when neither of the Pipelines is at the salon. It only happened once when they had lost their cousin and went to the village in Mityana for the burial leaving the salon in the care of the workers. For the two days they were away, their sales were very low and the neighboring salons cashed in. Since then, at least one of them has to be around.

Mr. Pipeline pays and treats his employees well in order to avoid the costs of high labor turnover; this has enabled him to maintain his workers for long. Owners of the neighboring salons have a misconception that the Pipelines use charms to attract and keep their customers and at times they display their jealousy and hostility openly.

At the end of every year, Mr. Pipeline analyses his business records to assess the performance of the business and pays taxes to URA. At the end of last year, his sales were sh250,000,000, the cost of sales were sh80,000,000 and expenses were shs.50,000,000.

Questions

a) (i) Identify personal entrepreneurial qualities possessed by Pipelines

ii) Which other qualities should they have to be more successful?

b) Identify the costs of high labor turnover that the Pipelines are trying to avoid by keeping their workers happy and motivated

c) Identify the customer care services offered by the Pipelines

d) Advise the Pipelines on the importance of paying taxes

e) Compute the following ratios as per the end of last year

i. Mark-up

ii. Net profit ratio

SECTION B: SCHOOL BUSINESS CLUB

2. With reference to the School Business project owned and operated by your club:

a) Give the general description of the project

b) Explain the measures that were taken to ensure proper cash management

c) Describe the entrepreneurial skills acquired by club members

d) (i) Outline the risks that were faced by the business

(ii) What measures were taken to minimize risks mentioned in 2(d) (i) above

3. With reference to a business project owned by your school business club;

a) What were the objectives of the project?

b) How did you manage time in the club?

c) What measures were taken to maintain the quality of your products?

d) Describe the methods that were used to minimize costs in the project.

SECTION C: FIELD ATTACHMENT/FIELD TRIP

4. For any business you were attached to;

a) Give the general description of the business

b) How does the business motivate its workers?

c) Describe the documents used by the business.

d) What measures does the business use to ensure discipline of its employees?

e) Outline the benefits of the business to the surrounding community.

5. For any field trip carried out as an individual or as a group

a) State the objectives of the field trip

b) Describe the steps followed in the purchasing plan of the business

c) Describe the internal control systems used by the business

d) (i) What challenges are faced by the business?

(ii) Advise the business on how to solve the challenges mentioned in d (i) above.

MATHEMATICS ANSWERS (AMATHS005)

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1. $2\cos\theta - \frac{1}{\sin\theta} = 0$

$2\cos\theta\sin\theta = 1$

$\sin 2\theta = 1$

$2\theta = \sin^{-1} 1$

$2\theta = 90, 180, 450, 540$

$\theta = 45°, 90°, 225°, 270°$

2. $\frac{d}{dx}(x^3 y) - \frac{d}{dx}(b^2) = \frac{d}{dx}(0)$

$x^3\frac{dy}{dx} + 3x^2 y = 0$

$\frac{dy}{dx} = \frac{-3y}{x}$

At point m, $\frac{dy}{dx} = \frac{-3(bt^2)}{\frac{b}{t}}$

Equation of the tangent at point m is,

$-3t^2 = \frac{y - bt^2}{x - \frac{b}{t}}$

Making y the subject of the formula gives

$y = -3t^2 x + 4t^2 b$

3. Let the square root of $5 + 12i = \pm(a + bi)$

Squaring both sides gives

$5 + 12i = (a + bi)^2$

$5 + 12i = a^2 - b^2 + 2abi$

Equating real to real and imaginary to imaginary

$a^2 - b^2 = 5$ (i)

$2ab = 12$ (ii)

Solving equation (i) and (ii) gives

$a = \pm 3$ and $b = \pm 2$

Therefore, the square root of $5 + 12i = \pm(3 + 2i)$

4. $\alpha + \beta = -3$ and $\alpha\beta = \frac{2}{5}$

Sum of roots $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = \frac{3\alpha\beta(\alpha + \beta)}{\alpha\beta}$

$= \frac{(-3)^3 - 3\times\frac{2(-3)}{5}}{\frac{2}{5}}$

$= \frac{-117}{2}$

Product of roots $\frac{\alpha^2}{\beta} + \frac{\beta^2}{\alpha} = (\alpha\beta)$

$= \frac{2}{5}$

$x^2 -$ (sum of the roots)x

+ Product of the roots = 0

$x^2 + \frac{117x}{2} + \frac{2}{5} = 0$

5. Consider $\int x\sin 2x\,dx$

Let $v = x$ and $\frac{du}{dx} = \sin 2x$

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MATHEMATICS ANSWERS (AMATHS006)

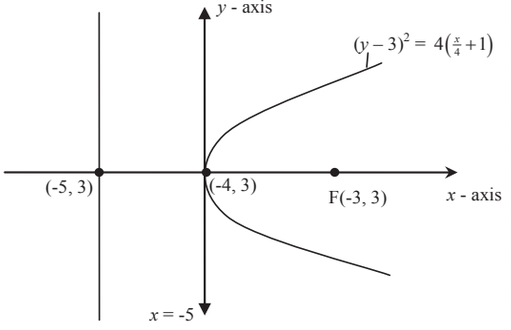
$\frac{dv}{dx}=1$ and $u=\frac{-\cos 2x}{2}$

$\int x\sin 2x dx=\frac{-x\cos 2x}{2}+\frac{1}{2}\int\cos 2x dx$

$\int_0^{\frac{\pi}{2}} x\sin 2x dx=\left[\frac{-x\cos 2x}{2}+\frac{\sin 2x}{4}\right]_0^{\frac{\pi}{2}}$

$=\frac{\pi}{4}$

6. Completing the square gives
$(y-3)^2-9-x+5=0$
$(y-3)^2=x+4$
$(y-3)^2=4\left(\frac{x}{4}+1\right)$
Comparing with $y^2=4ax$
The vertex is at (-4, 3) focus is at (-3, 3) and the equation of the directrix is $x=-5$.



Hence $x=-5$, is the equation of directrix

7. $d=\begin{pmatrix}-4\\2\\8\end{pmatrix}$

$n=\begin{pmatrix}3\\3\\-4\end{pmatrix}$

$\sin\theta=\frac{n.d}{|n||d|}$

$n.d=\begin{pmatrix}3\\3\\-4\end{pmatrix}\begin{pmatrix}-4\\2\\8\end{pmatrix}$

$=-12+6-32$

$=-38$

$|n|=\sqrt{34}$

$|d|=\sqrt{84}$

$\sin\theta=\frac{-38}{\sqrt{34}\sqrt{84}}$

$\theta=\sin^{-1}\left(\frac{-38}{\sqrt{34}\sqrt{84}}\right)$

$\approx -44.3°$

8.

$y=Ine^{2x}-\frac{2}{3}In\left(\frac{x+3}{x-3}\right)$

$y=2xIne-\frac{2}{3}In\left(\frac{x+3}{x-3}\right)$

$but: Ine=1$

$\frac{dy}{dx}=2-\frac{2}{3}\left(\frac{-6}{x^2-9}\right)$

$\frac{dy}{dx}=2+\frac{4}{x^2-9}$ $\qquad \frac{dy}{dx}=\frac{2(x^2-7)}{x^2-9}$

9. (a) $1+i$, $1-i$ are roots of $z^4+3z^2-6z+10=0$
Some roots $=(1+i+1-i)$
Product of the roots $(1-i)(1+i)$
$=2$
From z^2- (sum of the roots)z + product of the roots = 0.
$z^2-2z+2=0$
Using long division,

$$z^2-2z+2\overline{)\,z^4+3z^2-6z+10}\;\big|\;z^2+2z+5$$
$$-\,(z^4-2z^3+2z^2)$$
$$2z^3+z^2-6z+10$$
$$-\,(2z^3-4z^2+4z)$$
$$5z^2+0z+10$$
$$-\,(5z^3-10z+10)$$
$$-\quad -\quad -$$

Since the reminder is zero, then $1-i$ is a root of the equation $z^4+3z^2-6z+10=0$
Hence $z^4+3z^2-6z+10=0=(z^2+2z+2)(z^2+2z+5)=0$
Also $z^2+2z+5=0$

$z=\frac{-2\pm\sqrt{(2)^2-4(5)}}{2(1)}$

$z=\frac{-2\pm\sqrt{-16}}{2}$

$z=-1\pm 2i$

∴ The other roots are $1-i$ and $-1\pm 2i$.

(b) $z\bar{z}+2z+2\bar{z}=5-4i$
Let $z=x+iy$ and $\bar{z}=x-iy$.
$(x+iy)(x-iy)-2(x+iy)+2(x-iy)=5-4i$
$x^2+y^2-2x-2iy+2x-2iy=5-4i$
$x^2+y^2-4iy=5-4i$
Equating real to real and imaginary to imaginary
$x^2+y^2=5$ and $4y=4$
$y=1$
$x^2+1=5$
$x^2=4$
$x=\sqrt{4}$
$x=\pm 2$
∴ $z=\pm 2+i$ and $\bar{z}=\pm 2-i$

10. $\frac{2x+1}{x+2}>\frac{1}{2}$

$\frac{2x+1}{x+2}-\frac{1}{2}>0$

$\frac{2(2x+1)-(x+2)}{2(x+2)}>0$

$\frac{3z}{2x+4}>0$

Critical Values $x=0$, $x=-2$.

	$x<-2$	$-2<x<0$	$X>0$
$\frac{3z}{2x+4}$	+	-	+

The range of values for $\frac{2x+1}{x+2}>\frac{1}{2}$ are $x<-2$ and $x>0$.

11. (a) Let $t=x^2-25$

$\frac{dt}{2x}=dx$

$=\int \not{x}(\ln t)\frac{dt}{2\not{x}}$

$=\frac{1}{2}\int\ln t dt$ _____ (i)

Let $v=\ln t$

$\frac{dv}{dt}=\frac{1}{t}$, $\qquad \frac{du}{dt}=1$

$\int du=\int dt$

$u=t$

From (i)

$\frac{1}{2}\int\ln t dt=t\ln t-\int \not{t}.\frac{1}{\not{t}}dt$

$=t\ln t-\int dt$

$=t\ln t-t+c$

$=t(\ln t-1)+c$

But $t=(x^2-25)$ and $dt=2xdx$

$\int x\ln(x^2-25)dx=(x^2-25)\left[\ln(x^2-25)-1\right]+A$

b) $\int_0^2\frac{dx}{x^2\sqrt{16-x^2}}$

Consider $\int\frac{dx}{x^2\sqrt{16-x^2}}$

let $x=4\sin\theta$, $\cot\theta=\frac{\sqrt{16-x^2}}{x}$

$dx=4\cos\theta d\theta$

$\int\frac{4\cos\theta d\theta}{16\sin^2\theta\sqrt{16-16\sin^2\theta}}$

$=\frac{1}{16}\int\cos ec^2\theta d\theta$

$=\frac{1}{6}\cot\theta+c$

$\int_0^2\frac{dx}{x^2\sqrt{16-x^2}}=\left[\frac{\sqrt{16-x^2}}{16x}\right]_0^2$

$=\frac{\sqrt{12}}{32}-\alpha$

$=\frac{\sqrt{3}}{16}-\alpha$

12. (a) From $\cos p-\cos\theta=2\sin\frac{p+\theta}{2}\sin\left(\frac{p-\theta}{2}\right)$

$p=q+45°$ and $q=\theta+60°$

$\cos(\theta+45°)-\cos(\theta+65°)=2\sin\left(\frac{2\theta+105}{2}\right)\left(\frac{-15}{2}\right)$

$=-2\sin(\theta+52.5)\sin(7.5)$

$-0.2611\sin(\theta+52.5)=0.4$

$\sin(\theta+52.5°)=(-1.5319)$

$\theta+52.5°=\sin^{-1}(-1.5319)$ (Impossible)

Since there is no $\sin^{-1}$ that is greater than -1.

(b) Let $y=\sin^2 2x$

$y+\delta y=\left(\sin 2(x+\delta x)\right)^2$

$\delta y=\left(\sin 2(x+\delta x)\right)^2-(\sin 2x)^2$

$\delta y=\left[(\sin 2x(x+\delta x)-\sin 2x)\right]\left[\sin 2(x+\delta x)+\sin 2x\right]$

$\delta y=4\left[\cos(2x+\delta x)\sin\delta x\right]\left[\sin(2x+\delta x)\sin\delta x\right]$

For small angles $\sin\delta x\to\delta x$.

Dividing by δx

$\frac{\delta y}{\delta x}=4\cos(2x+\delta y)\sin(2x+\delta x)$

As $\delta x\to 0$, $\frac{\delta y}{\delta x}\to\frac{\delta y}{\delta x}$

$\frac{\delta y}{\delta x}=4\cos 2x\sin 2x$ OR $2\sin 4x$

13. $y=\frac{x^2+3}{(x-5)(x+5)}$

When $x=0$, $\qquad y=\frac{-3}{25}$

Turning points

$$\frac{dy}{dx}=\frac{(x^2-25)2x-(x^2+3)2x}{(x^2-25)^2}$$

$$\frac{dy}{dx}=\frac{-56x}{(x^2-25)^2}$$

$$\frac{dy}{dx}=0$$

When $x=0$, $y=\frac{-3}{25}$.

Hence $\left(0,\ \frac{-3}{25}\right)$ is a turning point.

Nature of the turning point

	L.H.S	0	R.H.S
Sign of $\frac{dy}{dx}$	+		-
		Max	

Asymptotes

Vertical

$x=5$, $x=-5$

Horizontal

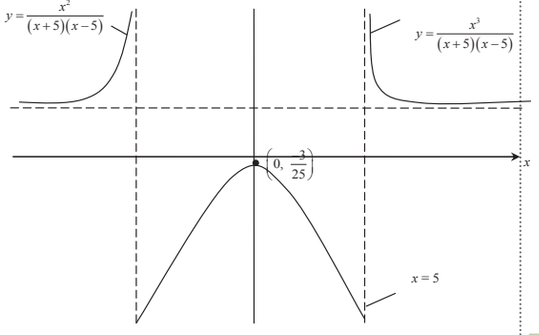
$y=\frac{x^2+3}{x^2-25}$ $\quad y=\frac{1+\frac{3}{x^2}}{1-\frac{25}{x^2}}$

As $x\to\pm\alpha$ $\quad y\to 1$

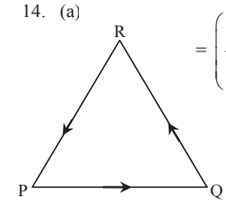
$y=1$

Critical values $x=-5$, $x=5$

	$x<-5$	$-5<x<5$	$x>5$
y	+	-	+



14. (a)



$$=\begin{pmatrix}2\\-1\\3\end{pmatrix}-\begin{pmatrix}5\\3\\1\end{pmatrix}+\begin{pmatrix}7\\-3\\10\end{pmatrix}-\begin{pmatrix}2\\-1\\3\end{pmatrix}+\begin{pmatrix}5\\3\\1\end{pmatrix}-\begin{pmatrix}7\\-3\\10\end{pmatrix}$$

$$=\begin{pmatrix}-3\\-4\\2\end{pmatrix}+\begin{pmatrix}5\\-2\\7\end{pmatrix}+\begin{pmatrix}-2\\6\\-9\end{pmatrix}$$

For a triangle $PQ + QR + RP = 0$

$$=\begin{pmatrix}0\\0\\0\end{pmatrix}$$

Since PQ + QR + RP = 0, then PQR is a triangle.

b) $\begin{pmatrix}x\\y\\z\end{pmatrix}=\begin{pmatrix}2\\0\\1\end{pmatrix}+\mu\begin{pmatrix}1\\3\\0\end{pmatrix}$

$x = 2 + \mu$

$y = 0 + 3\mu$

$z = 1$

From $5x - y - 7z - 9 = 0$

$5(2+\mu) - (3\mu) - 7 - 9 = 0$

$2\mu = 6$

$\mu = 3$

Thus $x = (2 + 3) = 5$

$y = 3(3) = 9$

$z = 1$

∴ The point of intersection is (5, 9, 1)

ANSWERS (AMATHS006)

b) (ii) $d=\begin{pmatrix}1\\3\\0\end{pmatrix}$ $\quad n=\begin{pmatrix}5\\-1\\-7\end{pmatrix}$

$$\sin\theta=\frac{n.d}{|n||d|}$$

$$\theta=\sin^{-1}\left[\frac{\begin{pmatrix}1\\3\\0\end{pmatrix}.\begin{pmatrix}5\\-1\\-7\end{pmatrix}}{\sqrt{10}\sqrt{75}}\right]$$

$$\theta=\sin^{-1}\left(\frac{2}{\sqrt{10}\sqrt{75}}\right)$$

$\theta = 4.2°$

15. (a) $2ydy = 4adx$

$$\frac{dy}{dx}=\frac{4a}{2y}$$

$$\frac{dy}{dx}=\frac{2a}{y} \text{ at } (ap^2, 2ap)$$

$$\frac{dy}{dx}=\frac{2a}{2ap}=\frac{1}{p}$$

Grad of the Normal (M)

$m_1m = -1$

$\frac{1}{p}m=-1$

$m = -p$

Equation of the normal

$$\frac{y-2ap}{x-ap^2}=-p$$

But $-p = m$ and $P = -m$

$y + 2am = m(x - am^2)$

$y + am^2 = mx - 2am$

b) Equations of the targets are

$py = x + ap^2$ …… at P …… (i)

$qy = x + aq^2$ …… At Q …….. (ii)

Solve (i) and (ii) gives

$x = apq$, $\quad y = a(p + q)$

Point R(apq, $a(p + q)$)

P(ap^2, $2ap$)

Q(aq^2, $2aq$)

Using any method of calculating the area of a triangle, then $A=\frac{1}{2}a^2(p-q)^3$.

16. (i) $\frac{d\theta}{dt}\alpha(\theta-15)$

$$\frac{d\theta}{dt}=-k(\theta-15)$$

$$\int\frac{d\theta}{\theta-15}=-k\int dt$$

$\ln(\theta-15)=-kt+c$

When $t = 0$ $\quad \theta = 80°c$

$\ln(80-15)=c$

$c = \ln 65$

$\ln(\theta-15)=-kt+\ln 65$

When $t = 10$, $\quad \theta = 60°c$

$\ln(60-15)=-10k+\ln 65$

$$-k=\frac{1}{10}\ln\left(\frac{45}{65}\right)$$

$$k=-\frac{1}{10}\ln\left(\frac{9}{13}\right)$$

$$\therefore \ln(\theta-15)=\frac{t}{10}\ln\left(\frac{9}{13}\right)+\ln 65$$

(ii) To find t when $\theta = 40°C$.

$$\ln(40°-15)=\frac{t}{10}\ln\left(\frac{9}{13}\right)+\ln 65$$

$$k=\frac{10\ln\left(\frac{25}{65}\right)}{\ln\left(\frac{9}{13}\right)} \qquad t = 25.984$$

$t \approx 26$ Minutes

MATHEMATICS QUESTIONS (AMATHS007)

1. Events A and B are such that $P(B)=\frac{5}{16}$ and $P(A'/B)=\frac{3}{5}$. Find

(i) $P(A\cap B)$,

(ii) $P(A/B)$.

2. (a) Given that $y=\theta cos\theta$, where θ is measured with a maximum possible error of 5%, find, for $\theta=120^o$,

(i) The maximum error in y,

(ii) The interval within which the values of y lies, correct to 4 decimal places.

3. The table below show the original marks obtained by students in physics and mathematics examinations.

Candidate	A	B	C	D	E	F
Physics	40	65	53	46	60	50
Mathematics	75	93	93	71	83	79

a) Calculate the rank correlation coefficient and comment on it.

b) The mathematics papers are remarked and one of the students is awarded additional five marks. Given that the rank correlation coefficient is unchanged, state with reach the student who received the marks.

4. Particles of masses 4kg, 3kg, 2kg, 9kg and 2kg are placed at points with position vectors $2\underset{\sim}{i}+4\underset{\sim}{j},\ -4\underset{\sim}{i}-2\underset{\sim}{j},\ \underset{\sim}{i}-4\underset{\sim}{j},\ -3\underset{\sim}{i}+5\underset{\sim}{j}$ and $4\underset{\sim}{i}+2\underset{\sim}{j}$ respectively. Find the position vector of centre of gravity of the system of particles.

5. A hammer of mass 4.5kg falls through a vertical height of 1m and hits a nail of mass 50 grams directly without rebounding. If the nail is driven into a piece of wood a depth of 2cm, find average resistance to penetration assuming that it is constant.

6. The foot lengths of different students were measured to the nearest centimetre and the results were as shown below.

20 24 25 26 28 27 23 22

25 27 22 26 23 24 27 20

Using a working mean of 22cm, find the standard deviation of these foot length.

7. A particle of mass 2kg initially moving with a velocity $\underset{\sim}{i}-4\underset{\sim}{j}$ is acted upon by a force $\mathbf{F}=4\underset{\sim}{i}+t\underset{\sim}{j}$. Find the speed of the particle when $t = 2$.

8. . The temperatures (^{0}C) of a cooling body measured every 10 minutes were recorded as 82, 70, 56, and 42. if the body's initial temperature is 93^{0}C, find the:

(i) Time taken for the body to cool to 63^{0}C

(ii) Temperature of the body after 45 minutes.

SECTION B

9. The table below shows the weight of seeds of a certain type of plant.

Weight (grams)	< 0.10	< 0.25	< 0.35	< 0.50	< 0.60	<0.65	< 0.80
Frequency	2	3	5	9	3	2	3

a) Calculate the;

i. Standard deviation

ii. Number of seedling that weigh more 0.57g.

b) Draw a histogram and use it to estimate the modal weight.

10. a) Car **P** of mass **1500kg** tows another car **Q** of mass **1000kg** up a hill inclined at $\sin^{-1}\left(\frac{1}{10}\right)$ to the horizontal. The resistance to motion of each car is $1\cdot5NKg^{-1}$

Turn to next page

PASS A'LEVEL

MATHEMATICS (AMATHS007)

If the power output of the towing car is **150kW,** find the maximum speed with which P and Q can travel up the incline.

c) find the Instantaneous acceleration and tension in the coupling between the car P and the car Q When P and Q are traveling at a speed of 54kmh^{-1} up the hill with the engine is working at the same rate.

11. In a machine producing firm, machine components are accepted if they pass through a gauge of 1.04cm and do not pass through a gauge of 0.96cm. It was discovered after a period of time that 3.5% and 1.5% of the smaller and larger gauge were rejected. Assuming that the distribution of the dimensions tested were normally distributed. Find the;
a) Mean and the standard deviation.
b) Interquartile range of the distribution
c) If a sample of 6 machines is taken from the firm, find the probability that the mean of the sample is between 0.98cm and 1.0cm

12. A uniform ladder of length $2l$ and weight, W rests in a vertical plane with one end against a rough vertical wall and the other against a rough horizontal surface, the angles of friction at each angle being $\tan^{-1}\left(\frac{1}{3}\right)$ and $\tan^{-1}\left(\frac{1}{2}\right)$ respectively.

(a) If the ladder is in limiting equilibrium at either end, find θ, the angle of inclination of the ladder to the horizontal

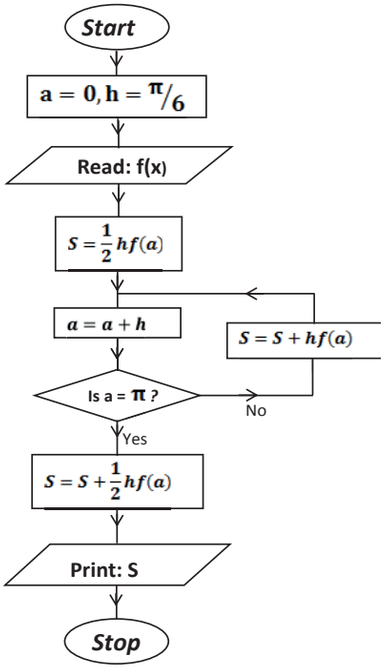
(b) A man of weight 10 times that of the ladder begins to ascend it, how far will he climb before the ladder slips?

13. At 2pm two ships A and B have position and velocity vectors $\left(10\hat{i}+5\hat{j}\right)$, $\left(-2\hat{i}+4\hat{j}\right)$ and $\left(2\hat{i}-\hat{j}\right)$, $\left(2\hat{i}+7\hat{j}\right)$ respectively. If the speeds are in kmh^{-1},

(i) Show that if the two ships continue with their consequent motions then a collision will definitely occur and find the time of this collision.

(ii) Find the distance and direction of ship A from the origin at the point of collision.

14. Study the flow chart below.



15. a) By plotting graphs of $y = Sinx$ and $y = e^{-2x}$ on the same axes, show that there is only one positive root in the interval [0, 1.4] of the equation $e^{2x}Sinx = 1$.

(b) Show that the iterative formula based on the Newton-Raphson method for estimating the root in (a) above is $x_{n+1} = \dfrac{x_n + (2x_n - 1)\tan x_n + e^{-2x_n}\sec x_n}{1 + 2\tan x_n}$,

c) Use the formula to find the root of the equation correct to 3 decimal places.

16. A random variable X has a probability density function $f(x)$, where ;

$$f(x) = \begin{cases} ax; & 0 < x < 1 \\ \frac{1}{2}a(3-x); & 1 < x < 3 \\ 0; & elsewhere \end{cases}$$

(a) Sketch $f(x)$

(b) use it to find the mode and the value of a

(b) Find the cumulative distribution function $F(x)$ and hence find $P(0.5 \le x \le 2.5)$ and the median of x.

Look out for answers next Tuesday

CHEMISTRY ANSWERS (ACHEMS006)

1.(a) Mass of carbon = $\frac{12}{44}x2.64$=0.72g

Mass of hydrogen = $\frac{2}{18}x0.9 = 0.1g$

Mass of oxygen=0,98-(0.72+0.1 =0.16g

Elements	C	H	O
Moles	$\frac{0.72}{12}$ =0.06	$\frac{0.1}{1}$ =0.1	$\frac{0.16}{16}$ =0.01
Mole ratio	$\frac{0.06}{0.01}$ =6	$\frac{0.1}{0.01}$ =10	$\frac{0.01}{0.01}$ =1

Empirical formula of Q is $C_6H_{10}O$

(b)(i) $\dfrac{mass of Q \text{ in } distillate}{mass of water distillate} = \dfrac{V.P of Q x Mr_Q}{V.P of water x Mr_{H_2O}}$

$$\frac{14.88}{0.60} = \frac{(1-0.18)xMr_Q}{0.18x18} \Rightarrow Mr_Q = 97.99$$

RFM of $(C_6H_{10}O)$n=97.99

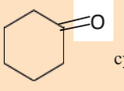
(12x6xn)+(1x10xn)+(16xn)=97.99

98n=97.99

n=97.99/98

n=1

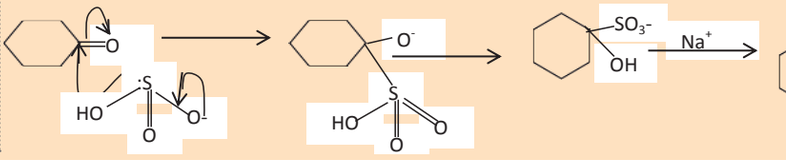
Molecular formula of Y is $C_6H_{10}O$

(ii)  cyclohexanone

C(i) 

Mechanism

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



THE TEACHERS

MOSES MUGOGO,
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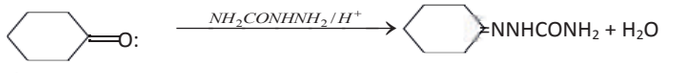
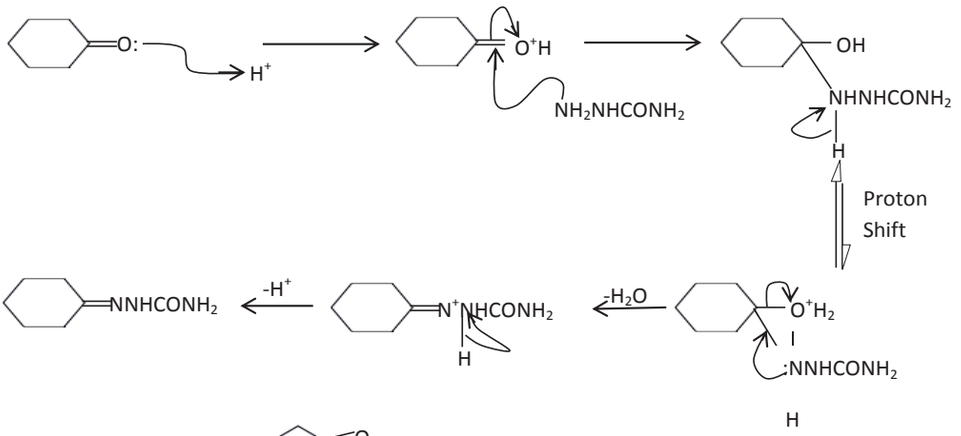
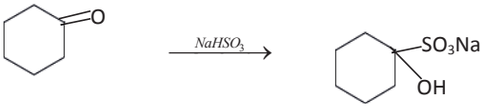
CHEMISTRY ANSWERS (ACHEMS006)

C(ii)

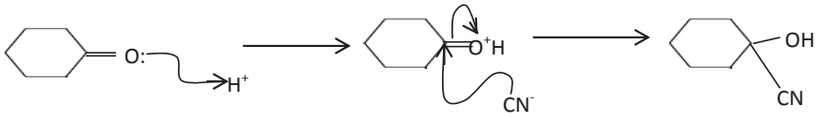


Mechanism

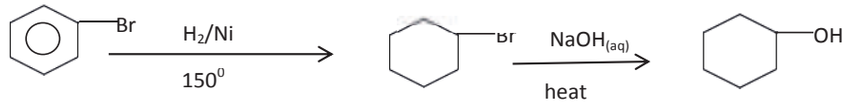


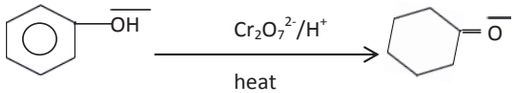


(iii) KCN ⟶ K$^+$ + CN$^-$



(d)





2. (a) (i)carbon, silicon germanium and tin react with dry air when heated to form dioxides while lead react with dry air when heated to form lead(II)oxide.

$C_{(s)} + O_{2(g)} \longrightarrow CO_{2(g)}$

$X_{(s)} + O_{2(g)} \longrightarrow XO_{2(s)}$

(X =Si, Ge, Sn)

$2Pb_{(s)} + O_{2(g)} \longrightarrow 2PbO_{(s)}$

(ii) Carbon does not react with bromine when heated, silicon, germanium and tin react with bromine when heated to form tetrabromides.

$X_{(s)} + 2Br_{2(g)} \longrightarrow XBr_{4(s)}$

(X =Si, Ge, Sn)

Lead reacts with bromine when heated to form lead(II)bromide.

$Pb_{(s)} + 2Br_{2(g)} \longrightarrow PbBr_{2(s)}$

(iii) Carbon reacts with hot concentrated nitric acid to form carbondioxide nitrogendioxide and water

$C(s) + 4HNO_{3(aq)} \longrightarrow CO_{2(g)} + 4NO_{2(g)} + 2H_2O_{(l)}$

Silicon does not react with nitric acid

Germanium reacts with hot concentrated nitric acid to form germanium(IV)oxide nitrogendioxide and water

$Ge(s) + 4HNO_{3(aq)} \longrightarrow GeO_{2(l)} + 4NO_{2(g)} + 2H_2O_{(l)}$

Tin reacts with hot concentrated nitric acid to form Tin(IV)oxide nitrogendioxide and water

$Sn(s) + 4HNO_{3(aq)} \longrightarrow SnO_{2(l)} + 4NO_{2(g)} + 2H_2O_{(l)}$

Lead reacts with hot concentrated nitric acid to form lea(II)nitrate nitrogendioxide and water

$Pb(s) + 4HNO_{3(aq)} \longrightarrow Pb(NO_3)_{2(ag)} + 4NO_{2(g)} + 2H_2O_{(l)}$

(b) Two layers are formed with carbontetrachloride . With silicontetrachloride effervescence of white fumes and a white solid are formed while with leadtetrachloride effervescence of white fumes and a brown solid are formed.

(c) $PbO_2(s) + 4HCl_{(aq)} \longrightarrow PbCl_{4(ag)} + 2H_2O_{(l)}$

conditions: cold concentrated hydrochloric acid.

(d) (i) pale yellow solution turns to bright yellow

$PbCl_{4(ag)} + 2HCl_{(aq)} \longrightarrow PbCl_4^{2-}{}_{(aq)} + 2H^+_{(aq)}$

(ii) yellow precipitate is formed.

$2NH_4^+{}_{(aq)} + PbCl_6^{2-}{}_{(ag)} \longrightarrow (NH_4)_2PbCl_{6(s)}$

3(a) (i) Electrolytic conductivity is the conductance of a given solution containing one mole of an electrolyte enclosed between electrodes of cross sectional area of 1cm^2 or 1m^2 and a distance of 1cm or 1m apart.

(ii) Molar conductivity is the conductance of a given solution of an electrolyte enclosed between electrodes of cross sectional area of 1cm^2 or 1m^2 and a distance of 1cm or 1m apart

(b) (i) Excess of silver chromate is shaken with a given volume of distilled water . It is left to stand until equilibrium is established. The mixture is filtered to obtain a filtrate which is a saturated solution of silver chromate. The electrolytic conductivity of the saturated solution is measured using a conductivity meter. If the elecolytic conductivity of water is known the electrolytic conductivity of silver chromate can be determined.

$$\frac{K_{solute}}{} = \frac{K_{solution} - K_{water}}{}$$

The molar conductivity of silver ions and chromate ions at infinite dilution can obtained books and can be used to determine the molar conductivity of silver chromate.

$$\frac{\Lambda_{\infty Ag_2CrO_4}}{} = \frac{2\Lambda_{\infty Ag^+}\Lambda_{\infty CrO_4^{2-}}}{}$$

The molar concentration of silver chromate which is the solubility can now be calculated.

$$solubility = \frac{electrolyticconductivity}{molarconductivity}$$

If C mol.dm^{-3} is the solubility of silverchromate, the solubility product can be determined as follows;

$Ag_2CrO_{4(s)} \longrightarrow 2Ag^+_{aq} + CrO_4^{2-}$

$K_{sp} = [Ag^+]^2 + [CrO_4^{2-}]$

$[Ag^+] = 2C$

$[CrO_4^{2-}] = C$

$K_{sp} = (2C)^2 xC$

$K_{sp}=4C^3$ Mol.^{3}dm^{-9}

More chemistry answers next Tuesday

Answers and more questions next Tuesday

LOOK OUT FOR O'LEVEL GEOGRAPHY & ENTREPRENEURSHIP TOMORROW