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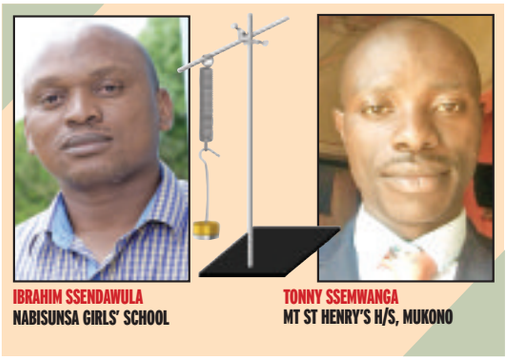
HOME SCHOOLING MATERIAL

PASS A' LEVEL

BIOLOGY, PHYSICS AND GENERAL PAPER

YOUR GUIDE AWAY FROM SCHOOL

SOLUTIONS TO PHYSICS (APHY 004)



IBRAHIM SSENDAWULA
NABISUNSA GIRLS' SCHOOL

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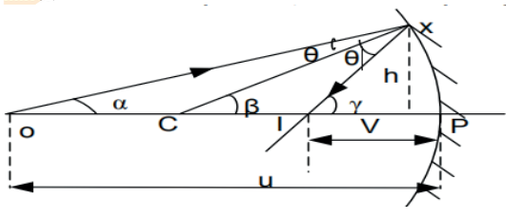
1. (a) (i) **Principal focus** is the point on the principal axis to which rays that are close and parallel to the principal axis converge to for a concave mirror or appear to diverge from for a convex mirror after reflection by the mirror.

(ii) Derivation of the equation, $\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$.

Consider a point object O on the principal axis of a concave mirror.



From triangle OXC; $\theta = \beta - \alpha$ --------(i)

From triangle CXI; $\theta = \gamma - \beta$ ---------(ii)

Equating equations (i) = (ii)

$\beta - \alpha = \gamma - \beta$

$2\beta = \gamma + \alpha$ ----------(iii)

For small angles in radians; $\tan\alpha \approx \alpha$, $\tan\beta \approx \beta$ *amd*

$$\frac{2h}{CP}=\frac{h}{IP}+\frac{h}{OP}$$

$$\frac{2}{r}=\frac{1}{v}+\frac{1}{u}$$

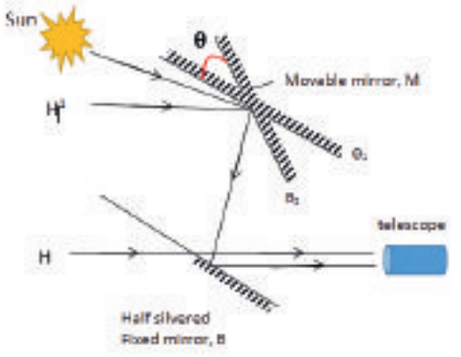
But $r = 2f$

$$\frac{2}{2f}=\frac{1}{v}+\frac{1}{u}$$

$$\boxed{\frac{1}{f}=\frac{1}{v}+\frac{1}{u}}$$

Read about the derivation of $\frac{1}{u}+\frac{1}{v}=\frac{1}{f}$ for a convex mirror.

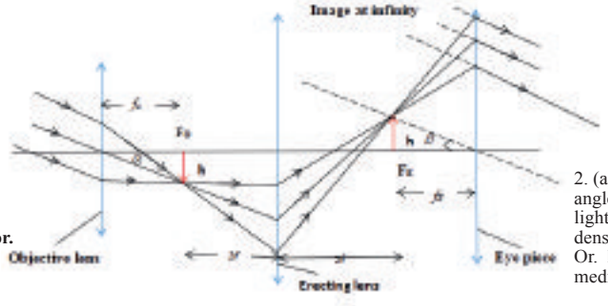
(b) A sextant is an instrument used to measure the angle of elevation of heavenly bodies such as the star or the sun.



- First focus at the horizon H through the un silvered part of the fixed mirror B using the telescope.
- Then rotate the movable mirror until the image of the horizon H¹ is seen to coincide with that of image of horizon, H. At this point, the movable and fixed mirrors are parallel to each other.
- Note the position of the movable mirror on the scale as θ1
- Rotate the movable mirror until the image of the star is seen to coincide with the image of horizon H.
- Note the new position of the movable mirror on the scale as θ_2.
- Calculate the angle of rotation, θ from; $\theta = \theta_2 - \theta_1$
- The angle of elevation of the sun is 2θ.

(c) (i) Angular magnification is the ratio of the angle subtended by the final image at the aided eye (when using an instrument) to the angle subtended by the object at an unaided eye (naked eye).

(ii) A Terrestrial telescope is a refracting telescope with an intermediate erecting lens of focal length f, which is placed between the objective lens and the eyepiece. The erecting lens should be a distance 2f after the principal focus of the objective lens and a distance 2f before the principal focus of the eyepiece. Diagram of a terrestrial telescope.



Note

Angular magnification, $m = \frac{\beta}{\alpha}$

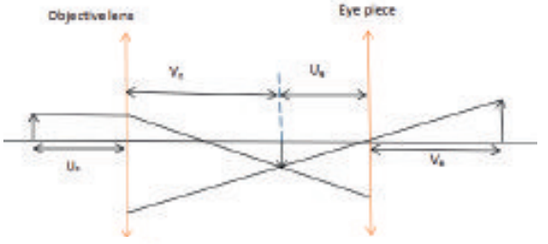
For small angles in radians, $\beta \approx \tan\beta = \frac{h}{f_E}$

$$\alpha \approx \tan\alpha = \frac{h}{f_o}$$

$$m = \frac{\beta}{\alpha} = \frac{\frac{h}{f_E}}{\frac{h}{f_o}} = \frac{f_o}{f_E}$$

$$\boxed{m = \frac{f_o}{f_E}}$$

(d)(i)



Given;
U_e=1.1cm, f_o=1.0cm, f_e = 5.0cm, V_e = 30cm

Action of the objective;

$$\frac{1}{f_o}=\frac{1}{U_o}+\frac{1}{V_o}$$

$$\frac{1}{V_o}=\frac{1}{f_o}-\frac{1}{U_o}$$

$$\frac{1}{V_o}=\frac{1}{1.0}-\frac{1}{1.1}$$

$$V_o = 11.0cm$$

Action of the eye piece;

$$\frac{1}{f_e}=\frac{1}{U_e}+\frac{1}{V_e}$$

$$\frac{1}{U_e}=\frac{1}{f_e}-\frac{1}{V_e}$$

$$\frac{1}{U_e}=\frac{1}{5.0}-\frac{1}{30}$$

$$U_e = 6.0cm$$

separation of the lenses $V_O + U_e = 11.0 + 6.0 = 17.0cm$

(ii)

Compound microscope	Astronomical telescope
Used to view nearby objects	Used to view distant objects
Has an objective lens of short focal length	Has an objective lens of long focal length
In normal adjustment, the final image is formed at the near point	In normal adjustment, the final image is formed at the infinity.

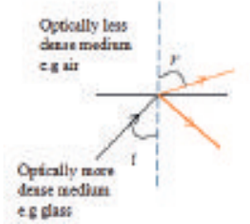
2. (a) Refractive index of a material is the ratio of the sine of angle of incidence to the sine of angle of refraction for a ray of light traveling from one medium to another of different optical densities.

Or. It can also be defined as the ratio of the speed of light in one medium to the speed of light in another medium.

Note: If medium 1 is a vacuum, then we refer to it as absolute refractive index.

Absolute Refractive index of a material is the ratio of the sine of angle of incidence to the sine of angle of refraction for a ray of light traveling from a vacuum to a given medium.

(b)



When light travels from a more optically dense medium to a less optically less dense medium, some of it is reflected while a bigger part is refracted. The refracted ray is brighter.

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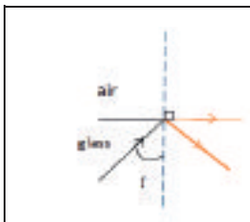
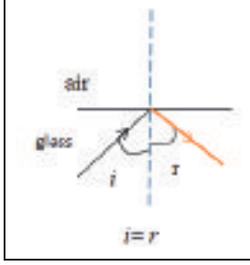
PHYSICS SOLUTIONS (APHY 004)

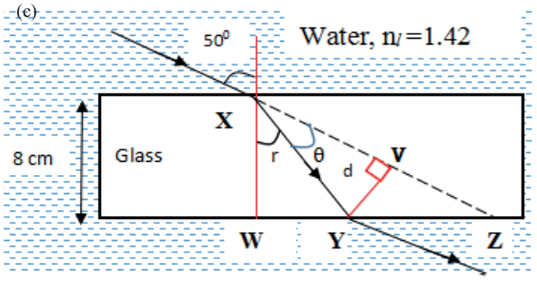


When the angle of incidence, *i,* is gradually increased, the angle of refraction, *r* also increases. At a certain angle of incidence, the angle of refraction becomes 90^0 and the ray grazes the surface (moves along the boundary).
At this moment, the angle of incidence in the less dense medium to which the angle of refraction in the denser medium is 90^0 is called the *critical angle.*



When the angle of incidence is further increased beyond the critical angle, the light ray becomes totally internally reflected in the optically dense medium.
At this stage, we say that *total internal reflection* has occured.

(c)



d = 1.76 cm

From the diagram, lateral displacement, d = 1.76 cm

From Δ XWY, $\text{Cos r} = \frac{WX}{XY} \Rightarrow XY = \frac{WX}{\text{Cos r}} = \frac{8}{\text{Cos r}}$ .....(i)

$\angle i = 50^0$. Also $\angle 50^0 = \angle(r+\theta)$, Therefore, $\angle YXV = \angle\theta = 50 - r$

Similarly, from Δ XYV, $\text{Sin}\,\theta = \text{Sin}\,(50-r) = \frac{d}{XY} \Rightarrow XY = \frac{1.76}{Sin(50-r)}$

Equating (i) and (ii) gives;

$$\frac{8}{\text{Cos r}} = \frac{1.76}{\text{Sin}\,(50-r)} \Rightarrow \frac{\text{Sin}\,(50-r)}{\text{Cos r}} = 0.22$$

$r = 46.51^0$

Applyingsnell's law,

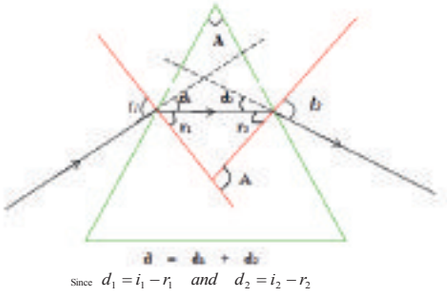
$\text{n}_w \text{ Sin i}_w = \text{n}_g \text{ Sin i}_g$

$1.42 \text{ Sin } 50 = \text{n}_g \text{ Sin r}$

$$\text{n}_g = \frac{1.0878}{\text{Sin r}} = \frac{1.0878}{Sin 46.51} = \frac{1.0878}{0725} = 1.50$$

$\therefore$ refractive index of glass; $\text{n}_g = 1.50$

(d) (i)



$d = d_1 + d_2$

Since $d_1 = i_1 - r_1$ *and* $d_2 = i_2 - r_2$

$$d = (i_1 - r_1) + (i_2 - r_2)$$

$$d = (i_1 + i_2) - (r_1 + r_2)$$

Since $A = r_1 + r_2$

$$d = (i_1 + i_2) - A$$

For minimum deviation; $i_1 = i_2 = i$ and $r_1 = r_2 = r$

$$D = 2\,i - A \quad \Rightarrow i = \frac{d_{\min} + A}{2}$$

Also $A = r_1 + r_2 = 2r \quad \Rightarrow r = \frac{A}{2}$

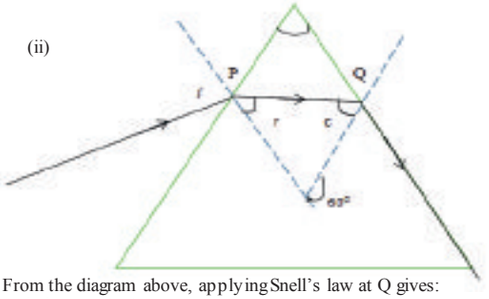
From Snell's law; $n_a \, Sin\, i = n_g \, Sin\, r$

$$n_g = n_a \frac{Sin\, i}{Sin\, r} \Rightarrow ng = na \frac{Sin\left(\frac{D+A}{2}\right)}{Sin\left(\frac{A}{2}\right)}$$

But $n_a = 1$

$$\therefore n_g = \frac{Sin\left(\frac{D+A}{2}\right)}{Sin\left(\frac{A}{2}\right)}$$

(ii)



From the diagram above, applying Snell's law at Q gives:
n sin i = constant

$$n_g \sin i_g = n_a \sin i_a$$

1.50 sin c =1 × sin 90^0 =1
sin c =0.667
c = 41.8^0

But $r = A - c = 60 - 41.8 = 18.2^0$

Applying Snell's law at P gives;
1.5 sin r = 1 × sin i
1.5 sin 18.20 = sin I
sin i= 0.4685
i = 27.9^0

SECTION B.

3. (a) (i) An overtone is a note whose frequency is higher than the fundamental frequency produced by an instrument.
You should not confuse an overtone with the harmonic.
A Harmonic is a note whose frequency is an integral multiple of the fundamental frequency.
OR..
A harmonic is one of the frequencies that can be produced by a particular instrument. (Such as a string or pipe).

(ii) Given; length, l=1.0m

Mass, m = 10.0g = $\frac{10.0}{1000} = 0.01kg$

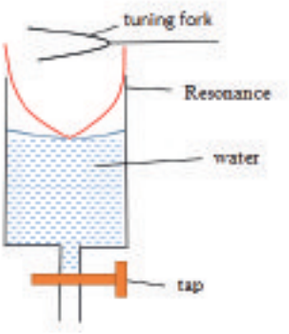
Tension, T= 200N.

From; $V = \sqrt{\frac{T}{\mu}}$, where $\mu = \frac{mass}{length} = \frac{m}{l} = \frac{0.01}{1.0} = 0.01 kgm^{-1}$

Also fundamental frequency, $f_0 = \frac{V}{2l} \Rightarrow f_0 = \frac{\sqrt{\frac{T}{\mu}}}{2l} = \frac{\sqrt{\frac{200}{0.01}}}{2\times 1.0} = 70.71Hz$

Frequency of the 2nd harmonic = $2 f_0 = 2 \times 70.71 = 141.42Hz$

(b) Experiment to determine resonance of sound in air.



- A glass tube with a tap at the bottom is filled with water.
- A sounding tuning fork is brought to the mouth of tube.
- The water is then slowly drained until a loud sound is heard.
- The loud sound heard is an indication of resonance of sound in air. This is referred to as the first resonance.
- The experiment can be repeated with other forks to produce other positions of loud sounds. All these indicate resonance of sound in air.

Read about the experiment to determine the speed of sound in air by the resonance method.

(c) (i) Doppler effect is the apparent change in the frequency of wave motion due to relative motion between the source and the observer.

(ii)

where; V_o - velocity of the observer
V_s - velocity of the source
V - velocity of sound waves
f - frequency of the waves

Velocity of sound relative to source, $V_S{}^1 = V - V_S = V + V_S$

Apparent change in wavelength, $\lambda^1 = \frac{V_S{}^1}{f} = \frac{V + V_S}{f}$

Velocity of sound relative to observer, $V_O{}^1 = V - V_O$

Apparent change in frequency, $f^1 = \frac{V_O{}^1}{\lambda^1} = \frac{V - V_O}{\lambda^1} = \left(\frac{V - V_O}{V + V_S}\right) f$

$$f = \left(\frac{340 - 20}{340 + 30}\right) \times 600 = \frac{320}{370} \times 600 = 518.92Hz$$

PHYSICS SOLUTIONS (APHY 004)

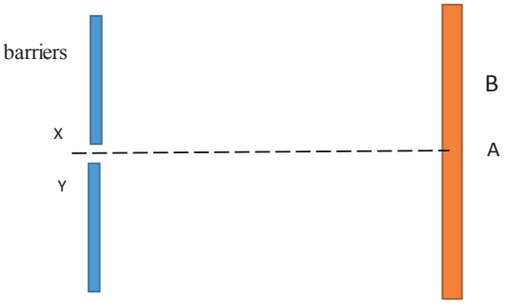
Read about applications of doppler effect.

(d) (i) Beats are a periodic rise and fall in the intensity of sound heard when two notes of nearly equal frequencies but similar amplitudes are sounded together.

(ii) Formation of beats using the principle of superposition. When two waves of nearly equal frequencies and similar amplitudes are sounded together, they meet and superpose. When they meet in phase, then constructive interference takes place and a loud sound is heard.
But when they meet completely out of phase, destructive interference takes place and soft sound is heard. A periodic rise and fall in intensity or loudness of sound is heard and this is called beats.

(e)Variation of pressure with displacement of air in a closed pipe. At the mouth of the pipe, the air is free to move and therefore the displacement of air molecules is large and the pressure is low. At the closed end, the air molecules are less free and the displacement is minimal or zero. This results into a high pressure at that end.

4. (a) Diffraction of waves is the spreading of light waves beyond their geometrical shadows / boundaries leading to interference.
(b) Diffraction pattern produced by a single slit.



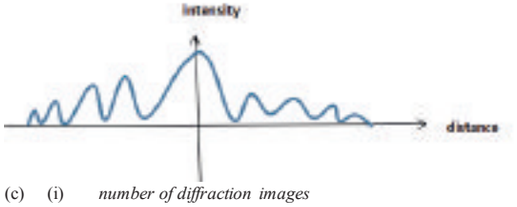
Consider a straight wave front arriving at a narrow gap XY between the barriers. Each point on the wave front acts as a secondary source of wavelets. All the secondary sources are coherent and the combined effect of the waves at any point, such as A and B is the sum of the effect of the individual waves at that point. At point A equidistant from X and Y, all the waves arrive in phase.

Constructive interference occurs at that point for the entire wavefront forming a central bright band. However, as you move up and down from

A, more and more pairs arrive out of phase and so the brightness diminishes (for the bright bands).

Between the bright bands, all the pairs of wavelets arrive out of phase and dark bands are formed.

A graph showing intensity variation with distance from the centre of the fridge system is shown below.



(c) (i) *number of diffraction images*

Given: wavelength, $\lambda = 600nm = 600\times10^{-9}\,m$
N = 650 lines per mm

$$d\sin\theta_{max} = n_{max}\lambda$$

but $\sin\theta_{max} = 1$

$$d = \frac{1}{N} = \frac{1}{650} = 1.54\times10^{-3}\,mm = 1.54\times10^{-6}\,m$$

Now;

$$n_{max} = \frac{1.54\times10^{-6}}{600\times10^{-9}} = 2.57$$

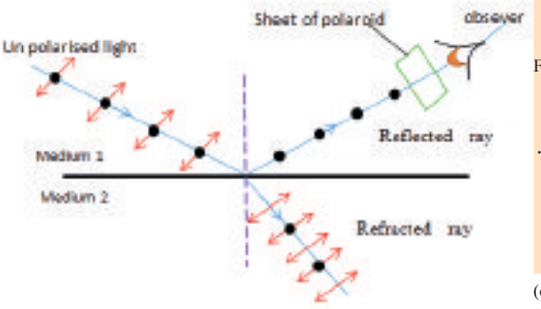
The highest order is 2.
Therefore, the total number of images is 5.

(ii) *angle of diffraction of the highest order diffraction image.*

$$\sin\theta = \frac{n\lambda}{d} = \frac{2\times600\times10^{-9}}{1.54\times10^{-6}}$$

$$\theta = 51.2^0$$

(d) (i) *Production of polarized light by reflection.*



When an un polarised light is incident on a boundary of a transparent medium, part of the light is partially reflected and the other partially transmitted into the denser medium.

The reflected light is viewed through a sheet of polarised light while turning the sheet about an axis perpendicular to its plane.

The procedure is repeated for other angles of incidence.

At one particular angle of incidence (polarizing angle), the reflected ray is completely plane-polarised (light is received only at a particular orientation of the polaroid) while the refracted ray is partially plane polarized.

At this point, the two rays are perpendicular to each other and vibrations in the reflected ray are parallel to the reflecting surface.

(ii) Uses of polarized light.

- Stess analysis
- Determination of the concentration of sugar in solution
- Liquid crystal displays (LCDs)

(e) Differences between the spectra produced by a prism and a diffraction grating.

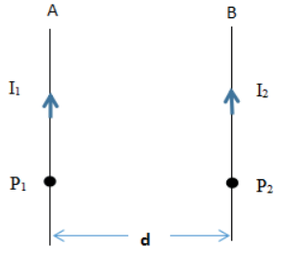
Prism	Diffraction grating
Produces single spectrum at a time	Produces many spectrum at a time
Shorter wave lengths are deviated most	Longer wave lengths are deviated most.
Produces less pure spectrum	Produces more pure spectrum

SECTION C

5. (a) A tesla is the magnetic flux density if a conductor of length 1m carrying current of 1A and placed perpendicular to a uniform magnetic field experiences a force of 1N.

Magnetic flux density is the force acting on a conductor of length 1m carrying current of 1A and placed in a direction perpendicular to the uniform magnetic field.

(b) Derive the expression for the force per metre between the wires.



Consider two parallel conductors A and B above, carrying currents I_1 and I_2 respectively.

The magnetic flux density, B_1 at point P_2 is due to current 1_1.

$$B_1 = \frac{\mu_0 I_1}{2\pi d}$$

Force, F_1 acting per metre length on wire B is given by;

$$F_1 = B_1 I_2 \sin 90 = \frac{\mu_0 I_1 I_2}{2\pi d}$$

Similarly, the magnetic flux density, B_2 at point P_1 is due to current I_2

$$B_2 = \frac{\mu_0 I_2}{2\pi d}$$

Force, F_2 acting per metre length on wire A is given by;

$$F_2 = B_2 I_1 \sin 90 = \frac{\mu_0 I_2 I_1}{2\pi d}$$

∴ Force per metre length between A and B is;

$F = F_1 = F_2$

$$F = \frac{\mu_0 I_1 I_2}{2\pi d}$$

(c) (i) An expression for the magnetic flux density, B at the centre of a circular coil

$$B = \frac{\mu_0\, N\, I}{2\, r}$$

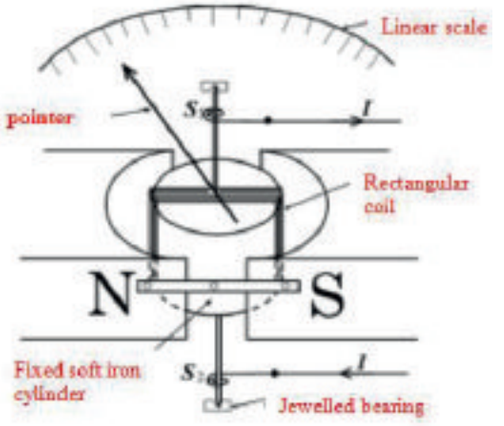
(ii) Given; length l = 12.0 m
Radius, r = 0.15 m
I = 4A

Number of turns, $N = \frac{12}{2\pi r} = \frac{12}{2\pi\times0.15}$

Magnetic flux density at the centre of the coil, B is;

$$B = \frac{\mu_0 NI}{2r} = \frac{4.0\pi\times10^{-7}\times4\times12}{2\times0.15\times2\pi\times0.15} = 2.13\times10^{-4}\ T$$

(d) (i) Structure and mode of operation of a moving coil galvanometer.



N and S are curved pole pieces of a permanent magnet;
S1 and S2 are hair springs and I is current.

Action

- The current I to be measured is fed in and out of the coil through the hair springs.
- The coil experiences a deflecting magnetic torque, $\tau_m = BINA$
- The coil then turns in the magnetic field with the pointer until it is stopped by the restoring torque, $\tau_m = k\theta$ (opposing torque) provided by the hair spring, where k is the torsional constant of the hair spring and θ is the deflection of the pointer.
- At the point of no deflection, the magnetic torque is equal to the restoring torque, that is; $BINA = k\theta$

$$\Rightarrow I = \left(\frac{k}{BAN}\right)\theta$$

- ✓ Since $\left(\frac{k}{BAN}\right)$ is a constant hence $I \alpha \theta$
- ✓ Therefore the reading is taken on a *linear scale.*

Read about the current and voltage sensitivity.

(ii) Structural modification needed to convert an A.C to a D.C generator.

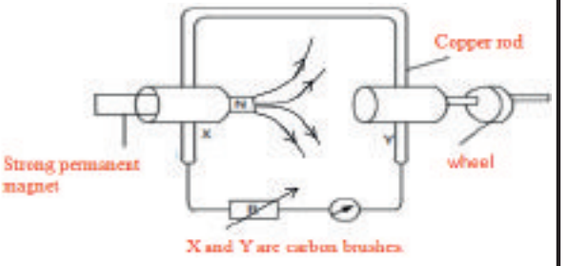
The slip rings are replaced by split rings/ commutators and the brushes arranged so that the change over of contacts occurs after each half of the cycle.

6. (a) (i) Laws of electromagnetic induction.

 The magnitude of the induced e.m.f in a circuit is directly proportional to the rate of change of the magnetic flux linked with the circuit. This is known as Faraday's law of electromagnetic induction.

 The direction of the induced e.m.f is such as to oppose the change causing it. This is known as Lenz's law of electromagnetic induction.

(ii) Experiment to verify Faraday's law of electromagnetic induction.



- A copper rod (or some other metal) which can be freely rotated round the North pole of a permanent magnet is connected as shown above.
- X and Y are metal contacts connecting the galvanometer G to the copper rod.
- Turn the wheel steadily (at constant speed) until the deflection of the galvanometer, θ is constant.
- Measure the time, *t* for *N* revolutions and determine the number of revolutions per second (frequency), *f* from $f = \frac{N}{t}$
- Also note the deflection, θ of the galvanometer.
- Repeat the experiment for different speeds of rotation of the wheel and record the corresponding values of θ and *f.*
- Plot a graph of against *f.* It is a straight line through the origin.
- This implies that $\theta \alpha f$ and since $\theta \alpha e.m.f$ induced then $f \alpha$ speed of rotation of the rod.
- Since $\frac{d\varphi}{dt} \alpha f$, then *e.m.f* induced α rate of change of magnetic flux, $\frac{d\varphi}{dt}$.

(b) Self-induction is a process in which an e.m.f is induced in a circuit due to changing current in the same circuit.

Mutual induction is a process in which an e.m.f is induced in a circuit due to changing current in a nearby circuit.

(c) (i) *number of turns in the secondary coil*

Given: $N_p = 3000$

$V_p = 240V$

$V_s = 12V$

Power in secondary, $I_S V_S = 36W$

$$\frac{N_S}{N_P} = \frac{V_S}{V_P} \Rightarrow \frac{N_S}{3000} = \frac{12}{240}$$

$$N_S = \frac{3000 \times 12}{240} = 150$$

More answers and questions next Friday

Write to us:
Email: ***learners@newvision.co.ug***

GENERAL PAPER QUESTIONS (AGP005)

SECTION A

1. Examine the impact of a large population to a country like Uganda. (50mks)
2. Discuss the role of science and technology in the development of Uganda. (50mks)
3. Justify the need for a national budget to your country. (50mks)
4. Discuss the likely benefits and challenges of reviving the East African Community to the member states. (50mks)

SECTION B

5. Bimpati Hospital has the following departments which provide services to the people in the community and beyond. They include: Outpatients, Radiology, General Surgery, Paediatric, Cancer, Intensive Care, Maternity, Physiotherapy, Cardiology, Isolation departments. At the entrance, the patients would be sent directly to the relevant department. On 30th April, an in-patient tested positive for Covid-19 and all hospital personnel on duty that day were sent into quarantine and self-isolation. The following day, a volunteer sat at the desk and received the following patients:

Patient-1 – the patient was suffering from Leukemia
Patient 2 – seemed paralysed and needed a scan
Patient 3 – was 6 years old and had chicken pox
Patient 4 – was a COVID-19 suspect
Patient 5 – had heart problems and could not breathe
Patient 6 – was heavily pregnant and was experiencing labour pains
Patient 7 – her caesarean section baby had died, but was still bleeding
Patient 8 – an accident survivor who was still struggling to walk
Patient 9 – was brought in bleeding and unconscious from a bar fight
Patient 10- had a hernia problem

Questions

a) Match each patient with the department to which they were sent

b) In the first 3 months of the year, the hospital had received 546 patients in 4 major departments of Outpatients, Surgery, Paediatric and Maternity in Ratios of 1:3:4:6 respectively:
i)State the number of patients for each department in that quarter.
ii) What was the average number of patients per month in the outpatients department?

c) Examine the challenges faced by Medical personnel in Government hospitals in Uganda today?

6. Read the passage below and answer the questions that follow using your own words as much as possible.

Whether you are in a relationship already or whether you are admiring someone from afar, sorting out your feelings can be a real challenge. While there is not clear fool-proof way to decipher your feelings for someone, there are certain ways to make the distinction clearer for yourself and to know the difference between love, infatuation and lust.

Do you care fir this person without knowing his or her faults? Are you committed to sticking together even through the most difficult circumstances? Can you tell this person everything about yourself, even if the truth doesn't flatter you, and you know that your partner will accept you? Do you know that whether your partner will stand by you no matter what, and are you prepared to commit to your partner for the rest of your life? Have you known this person for a long time and you can't imagine life without him or her? If you had ever had sex with your partner, does it make you feel closer to him or her? Are affections and post-coital cuddling just as important as sex, although you love to keep the flame alive?

When you have an agreement with your partner, keep working until you are able to find some common ground. No argument can erase your commitment to one another, and you appreciate your partner speaking the truth even when it is painful, something funny happens to you at work and you can't wait to tell your partner. Alternatively, you encounter a bad experience, and you want to talk to someone who will understand. If your partner is the first person that you think about when you want to share your innermost thoughts, then you are certainly in love.

If you're looking to catch someone as a prize or to get someone to go to bed with you: you're treating the person like a thing, you're probably experiencing lust.

When you experience infatuation, your mind is consumed by the thoughts of the other person. You are thinking not only about the other person but also how you want to reveal yourself to the other person. You have an idealized vision of what this person is like and your vision may be or may not be accurate.

Instead of feeling secure, you are thinking more about how to impress the other person. Your focus is on how to get the other person to like you, and feel nervous because you don't know how the person feels. Your relationship is pretty new, and while you're constantly thinking about the other person, you're not confident that he or she has what it takes to go the distance. Sex is exciting but you feel tentative afterwards. You worry about whether your partner found you appealing and you worry about what the next step after sex will be. You think constantly about the way the other person looks at you. You think obsessively about these details, and you try to decide how the person feels about you based on these somewhat trivial qualities. The person you like disagrees with you, and you wonder if the relationship is over. You wonder whether you know the person at all or whether your impressions have been wrong all along. You want to ask the person to date exclusively, but you are nervous about what he or she might say. You are afraid that asking for commitment may frighten the person away. Your feelings aren't deep enough for love; you're probably more in the realm of infatuation.

This phenomenon can be exacerbated when security isn't important to you. You are more interested in the score and in how great it feels to be physical together. After getting what you want, you can take or leave that person. You may just be meeting the person you're interested in, or you may have known the person for a long time. In either situation, the relationship is more about fulfilling sexual desires than it is about creating a partnership.

You may succeed in having sex with this person and even though it is great, your mind has nightcap. Your focus is on lowering the person's guard so that he or she will be open to a sexual encounter. Who cares if you have an argument? You can find someone new without the hassle of bickering and fighting. The sex is great, but it's not worth the baggage- unless its make-up sex after one of those passionate arguments.

In reality, you could care less about getting exclusive with your partner. You're satisfied to date other people, and you don't care if the other person also has multiple partners. Even though you may feel jealous if your lover finds another partner, your lack of commitment suggests infatuation not love!

Friendship should also weigh into your decision to commit. In the years ahead if you don't like your mate, you're going to be miserable.

Even if you think you love the other person, if that person doesn't return your feelings, don't waste too much time hoping that your love interest changes his or her mind. You'll have other opportunities to find someone who is ready to create a real and lasting partnership.

Questions

(a) Suggest a suitable title for the passage. (2marks)

(b) According to the passage, how can disagreement best be dealt with in a true love relationship? (4marks)

(c) In not more than 100 words, summarize the manifestations of infatuation. (14 marks)

(d) Explain the meaning of the following words and phrases as used in the passage, without changing their meanings.

i. fool-proof way to decipher (2 marks)
ii. doesn't flatter you (2 marks)
iii. flame alive (2 marks)
iv. an idealized vision (2 marks)
v. trivial qualities (2 marks)
vi. realm (2 marks)
vii. exacerbated (2 marks)
viii. nightcap (2 marks)
ix. the hassle of bickering (2 marks)
x. baggage (2 marks)

Spelling Punctuation Grammar Expression (SPGE) (10 marks)

GENERAL PAPER ANSWERS (AGP004)

SECTION A

Land conflicts are disputes among people over ownership or boundaries of land.

Causes:

- Poverty as this makes individuals unable to acquire land
- Succession disputes
- Commercialisation of land (for agriculture, industrialisation, etc)
- Failure of the police force to investigate and gather evidence over land conflicts in a timely manner.
- Inadequate investigations by courts of law as these mainly depend on police reports.
- Population growth hence leading to pressure on the available land.
- Inefficiency in the country's land registries for example in terms of the land registration process taking a long time.
- Political Interference by politicians who give contradictory directives to courts.
- Another is the issue of delay in compensation for land meant for public projects like roads especially due to corruption.
- The land tenure system (landlords)

Effects of land conflicts:

- Increased poverty among people
- Lack of sufficient land for agricultural production
- Displacement of people to other areas in case of public projects like roads
- Death of individuals involved in land conflicts
- Destruction of property due to violent evictions
- Loss of confidence in government by its nationals who expect protection for their lives and property
- Decline in the productivity of land
- Development of slums in urban centres

2. **Environmental degradation is the reduction/deterioration in the value of man's natural surrounding (endowments) such as plant life, land, water and air.**
Or: It is the deterioration in the value of the biosphere, the lithosphere, the hydrosphere.

Human activities

- Settlement on wetland, forests and game reserves for agriculture, housing, industries, etc.
- Industrialisation (and its productions)
- Deforestation due to lumbering, charcoal burning, brick making and burning, building, settlement, farming, etc.
- Mining and quarrying; copper mining at Kilembe, cement works at Tororo and Hima, clay works at Kajjansi (Entebbe), stone and sand quarrying throughout the country.
- Noise pollution (from noise generating machinery)
- Burial practices (concrete burial) cementing and tiling of graves.
- Poor disposal of waste e.g. sewage.
- Poaching in game parks, reserves and protected waters.
- Depletion of water resources like fish and water plants.
- Poor farming methods; over stocking, over-grazing, over cropping, monoculture, land fragmentation, bush burning, etc.
- Transport perils.
- Dangerous transfer of flora (like the water hyacinth and fauna like tilapia.

Other factors

- Natural hazards/ calamities.
- Pests and diseases.
- Chemical weathering and leaching.
- Cyclic climatic changes.

3. Child abuse is when a parent or caregiver, through action or failure to act causes injury, death, emotional harm to a child. The different forms of abuse are mistreatment like neglect, physical abuse, sexual abuse, exploitation and emotional abuse.

Causes:

- Poor parent-child relationship.
- Alcohol and drug abuse; Parents that take alcohol and abuse drugs are most likely to abuse their children.
- Parent's history of neglet.Adults who were neglected in their childhood are likely to neglect their own children as these missed the opportunity to be cared for and showed affection.
- Inadequate capacity of statutory protection services and community based structures to identify, support and follow-up child neglect and abuse cases.
- Limited access to compulsory free Education.
- Violation of the existing laws and codes of conduct as abusers get away with such cases.
- Ignorance about children's rights and freedoms may bar them from taking note of what they have been denied.

Effects:

- It threatens normal child development.
- It may cause distrust for adults.
- May result into array of characteristics and behavior as anger, anxiety, aggression, social withdrawal, low self-esteem, sleep difficulties and many others.
- A child may dissociate and develop disorders as amnesia and personality disorder and these may affect their everyday life in school, at work, and in relationships.
- Death may occur especially for very young children. (ages four and below).

4. African traditional values and customs refer to a collection/variety/forms of attitudes/beliefs/norms/and practices that are held/cherished by people in different societies of Africa.

Values

- They enhance/ aid/ facilitate/ promote learning/ study purposes for generations to come later.
- Helps promote discipline on proper conduct and morals in child upbringing
- Building unity and strengthening bonds among people in different African societies.
- Offer useful reference (archives) for future generation e.g. sex education.
- Helps in preservation of culture – the traditions, customs and beliefs, etc. the *Ekisakatte* organised annually by the Nabagereka of Buganda is a case in point.
- Promotion of art and aesthetics especially orature; i.e., oral aspect like songs, proverbs, riddles, etc.
- They define/ identify a people of a specific community and accord them their distinction different from others. E.g. male circumcision among the Bamasaba among the Sabiny people of Kapchorwa/ Bukwo.
- They instil pride/ love amongst people for their cultures.
- Entertainment and enjoyment of people

THE TEACHERS

MOYA MARTIN GEORGE ZAPWE,
KING'S COLLEGE, BUDO

NAKANWAGI JACKIE,
OUR LADY OF GOOD COUNSEL SSS, GAYAZA

SECTION B

5.

Trucker's name	Age	No of Yrs in Co
Wasemwa	47	09
Buladde	49(47+2)	1yr 6 months
Otieno	47(37+10)	10
Mulongo	47	03
Pokopiki	53(6+48)	06

b) i) Buladde
ii) Otieno

c) Mulongo (April)
Wasemwa (June)
Otieno (July)

d) **i) Challenges**

- Long delays at the border points waiting for covid-19 results
- Traffic congestion at the border
- Hostile communities along the way when they stop for food/rest
- Unable to visit their families at the end of a journey
- Very poor facilities at the official designated stop-over points
- Its tiring to drive alone in a big truck since co-drivers were prohibited
- Fear of contracting covid-19 as they carry out their jobs

ii) Possible Solutions

- Using quick testing kits which produce results quickly
- Assigning many officials to clear trucks at the borders quickly
- Educating roadside communities about harassing the truckers
- Improving facilities at designated official stopover points and food
- Allowing the truckers to have a co-driver
- Encouraging truckers to use sanitisers, keep distance, use masks, etc

6. (a) **Title** - Benefits of educating a woman
- The need for educating a woman

(b) **Meanings**

i. It means a woman is naturally endowed with goodness but if not nurtured or well-raised, her goodness may never yield or may go to waste.

ii. It means that a woman who is raised well and educated becomes exceptional or excellent.

c) **THE REASONS THE WRITER FORWARDS FOR THE NEED FOR EDUCATING A WOMAN**

- Education carries on the distinction and makes someone less brutish than others.
- God gave man equal capacities so none should be denied additions.
- He blames the error of in-human customs that hinders women from being wise.
- Women naturally have greater and their senses are quicker than those of men so should not be denied education.
- He states that men have a fear of women vying with them in their improvements.
- Being quick and sharp if given education would prove very sensible.
- He states that education makes a woman an exceptional creature.

(d)Meanings of words used in the passage

i. **Barbarous customs** – Uncivilised/archaic behaviour

ii. **Impertinence** – Without respect/rudeness

iii. **Conversible** – Free and pleasant/sociable

iv. **Manifest** – Evidence/proof

v. **Forfeit the privilege** – To be denied the benefit

vi. **Vie** – To compete or fight for something.

vii. **Retentive** – Having the power to absorb information

viii. **Emblem of sublime employments** – A symbol or representation of memory

ix. **Degenarates** – Decline or deteriorate

x. **Cloistered** – To isolate or keep away for the sake of maintaining innocence

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BIOLOGY PAPER 1 ANSWERS (ABIO 005)

THE TEACHERS

OJOK DEOGRACIOUS,
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ST MARY'S COLLEGE, KISUBI

SECTION A

1. (a) The first foliage leaves of annual plants usually wither and fall off within few days of growth. This would not provide adequate study time from which much measurement could be obtained – hence making it difficult to draw realistic conclusion.

(b) The least average surface areas for the two categories of plants were recorded at 10 days from the first day of leaf appearance while their highest averages of leaf surface areas were recorded at 65 days from the first day of leaf appearance.

- The average surface areas of leaves increased as time of investigation increased.
- The group Y recorded higher average surface areas of leaves in than that in group Z throughout the study period.

(c) Annual plants grown in atmosphere containing higher volume parts per million carbon dioxide grow and develop leaves with larger surface areas than those grown in atmosphere containing lower volume parts per million carbon dioxide.

(d) At low amount of carbon dioxide rate at which it is fixed in the Calvin cycle during photosynthesis is equally low. Rate of photosynthesis remains low with the result that small amount of food for growth is produced. Rate of growth of plant tissues such as leaves also become low making the leaves to have smaller surface areas. At higher amount of carbon dioxide rate at which it is fixed in the Calvin cycle during photosynthesis is higher. Rate of photosynthesis becomes higher and large amount of food for growth is produced. Rate of growth of leaves also become high making the leaves to have larger surface areas.

2. (a) Heart

(b) (i) Nucleus
(ii) Intercalary disc
(iii) Striations
(iv) Myofibril

Note: Remember when labelling line touches only one feature of a diagram you must use singular expression of the part being labelled while plural when two or more features of the same kind are having label lines emerging from them to a common label.

(c) The initial heartbeat originates from a group of specialised cardiac muscle cells, "pacemaker" called sino-atrial node (SA node) located near the wall of right atrium where vena cava enters it. Wave of excitation from SAN spreads outward causing atria to contract, generating pressure that pushes blood from atria into the ventricles. This wave of excitation is picked by similar cardiac muscle cells in the right atrium near the septum separating right atrium with left atrium, called atrioventricular node (AV node). The wave continues to be conducted by Purkinje fibres relatively slowly to the apex of the ventricles. Conduction of impulse to the apex is to ensure that the ventricles begin contracting from apex upwards in order to force blood into the aorta and pulmonary artery. The reduced speed of conduction is to enable delay in contraction between atria and ventricles to maintain pressure difference for blood to flow smoothly in one direction.

3. (a) (i) Jean Lamarck based is his theory on logic. He argued that evolutionary change is a function of direct effect of interaction between an individual organism and its environment. The theory is based on two mechanisms:

- Extensive use of body part leads to its increase in size and efficiency up to a limit which life itself determines. This characteristic will then be transmitted to the next generation.
- Under use or no use of body part will result in its decrease in size and efficiency or may disappear altogether. Such characteristic fails to be transmitted to the next generation.

(iii) To suggest that the formation of a new organ in the body is the result a new need arising from and continues to be felt by an animal contradicts embryological evidence. Example it is not true that a bird's wing develops necessarily as a result of need to fly yet the chick hatches when the wings are already developed. That acquired characteristic can be inherited in the next generation was incorrect. There is no evidence of inheritance of characteristics acquired during the life of an organism.

(b) (i) This type of speciation is called allopatric speciation.

(ii) If such demes become spatially separated by some barriers, like mountains, seas, oceans, rivers etc. they begin to independently adapt to the different selection pressures and form different species. With time they may fail to effectively associate with other demes, hence forming new species.

(c) (i) Is response to undesirable change in environment that tends to decrease the reproductive potential of an organism (altruist), while benefiting the reproductive success of other organism/ organisms of the society.

(ii) Putting oneself in position of danger protects younger individuals or other members in a population that do not either have adequate abilities to detect or defend themselves against such dangers. Members of the same species that can defend themselves more effectively in order to resist such environmental conditions will have higher chances to survive and pass on those survival characteristics to the next generation than those that are poorly exhibiting it.

4 (a) (i) Negative feedback is a mechanism in which the effect of deviation from the normal condition triggers a sequence of events which counteract the deviation and restores the system to its original set point (norm) while positive feedback is the mechanism in which the effect of deviation from the normal condition intensifies the original response such that the change tends to proceed in the same higher or lower magnitude away from the set point.

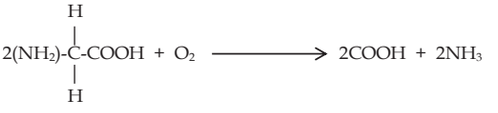
(ii) Examples of negative feedback:

- Regulation of glucose level in blood. Any decrease or increase in the amount of glucose in the blood (neither reduces below 70mg per 100cm3 nor exceeds 150mg per 100cm3 of blood)away from normal level of about 90mg per 100cm3 of blood sets in processes which normalises it to normal level. Too low sugar level means the body will be unable to derive sufficient energy while a level which is higher than normal leads to diabetes mellitus.
- Oxygen and carbon dioxide levels in the blood are maintained by controlling rate and depth of breathing and heart rate. Lower level of oxygen causes insufficient respiration-hence low energy to maintain other body activities while too high level of carbon dioxide causes too much ventilation rate and lowers pH in the tissues below what is required for enzymatic activities.
- Blood pressure has a set point of 120/80mmHg for systolic and diastolic pressure respectively. Upper limit of 135/90mmHg and lower limit of 110/75mmHg are within normal ranges of systolic and diastolic blood pressure. Abnormally high blood pressure may lead to bursting blood vessels to heart or brain. These maybe the leading cause of cardiac arrest and strokes respectively.
- Hormone levels are maintained at a balance to normal functioning of the body systems they control.
- Water and ionic balance are important in supplying the tissues with the required nutrient and water demands.
- The regulations of pH and body temperature constant are important in providing suitable environments for enzyme activities.

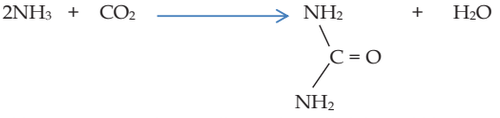
Examples of positive feedback include:

- When one has fever there will always be an increase in temperature for as long as one feels cold. This is due to the increased metabolic rate triggered by the stimulation from hypothalamus. A 10oC increase in temperature doubles metabolic activity, releasing more heat that raises the activity even more. It is said that rise in body temperature has beneficial effect in destroying the causative microbes. However, excessive increase also denatures cellular proteins which include the enzymes that are greatly required for catalysing cellular metabolism.
- During blood clotting to stop bleeding to keep blood volume constant, one clotting factor activates another in a cascade that leads quickly to the formation of a clot in order to avoid much loss of blood. (Cascade effect is the way in which a small amount of a substance, say hormone can cause a target organ to produce a large amount of products).
- During childbirth the head of the fully grown foetus presses on the cervix that becomes stimulated. Impulse is generated and transmitted to reach pituitary gland. This causes the gland to secrete oxytocin that is release stimulates contraction of uterus muscles. Further pressing keeps stimulating pituitary gland to secrete more oxytocin resulting severe contraction of uterus wall - hence the foetus is expelled during birth.
- Digestion of proteins in the stomach is continuous to ensure that much amino acids can be obtained in order to synthesis the different proteins required in the body.

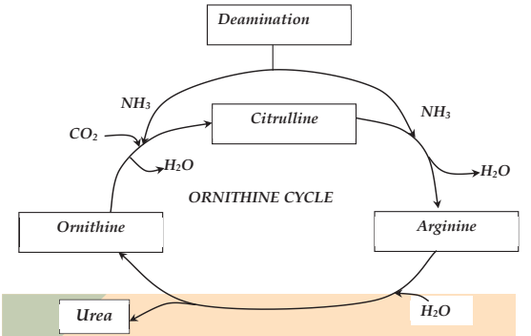
(b) (i) Ornithine /Urea Cycle
(ii) Liver
(iii) The body is unable to store excess amino acids taken up in the diet. Excess amino acids from digestion are deaminated in the liver. The amino group is removed resulting in the formation of ammonia and an acid.



Urea formation
The ammonia from deamination is carboxylated by addition of carbon dioxide so that it is converted into a less toxic and less soluble compound called urea and excretion.



This process occurs by a cyclic reaction called the ornithine/urea cycle, through a system of carriers.



Starting at ornithine overall, two molecules of ammonia and one molecule of carbon dioxide are used and one molecule of water is formed (two made and one used) and one molecule of urea. Ornithine is regenerated ready for the next cycle.

5. (a) Antherozooids (sperms) have very delicate membranes that can make them to easily dry up. Their flagella require film of moisture to swim from antheridia to the egg within the archeogonium.

(b) (i) Spore mother cells
(ii) Sporangium
(iii) Sorus (pleural, sori)

(c) Spores of ferns have single nucleus each while those of gymnosperm have three nucli (tube nucleus and generative nucleus).

- Gymnosperm spores have wing – like structures while spores of ferns do not have the wing – like structures.

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BIOLOGY PAPER 1 ANSWERS (ABIO 005)

- Spores of ferns are of the same kind but spores of gymnosperm are of different kinds.

(d) Is a means of surviving during harsh environmental conditions such as little available water and high temperature until such conditions are favourable again. They produce large quantity of spores at the onset of unfavourable conditions such that during the period of dormancy the spores are more effectively dispersed.

6. (a) Some possess penetrative and attachment devices for firm support onto hosts.
- They usually have thin integument (coat) for easy absorption of food.
- Some have their bodies flattened to increase the surface area for absorption of food. The whole body surface being absorptive in such cases.
- Some have ability to produce mucus or other resistant substances to prevent them from being digested by digestive enzymes or any other host reactions.
- Some respond to host's reactions by developing thick protective cuticle.
- Have some body parts like eyes, alimentary canal lacking or degenerated so as to create space for them to fit in or on the host.
- Some hermaphrodite with possibility of self–fertilisation to enhance high reproductive chances.
- Those that are confined in environment without usable oxygen tend to respire anaerobically.
- To increase chances of dissemination; they produce large numbers of eggs, cysts, spores or even reproduce in phases (during their life cycles) where they inhabit more than one hosts.
- Some have a wide range of hosts. This means they have high chances of feeding and survival.
- Some are able to release sexually mature, free–living organisms which are fit for adult life and be able to survive before securing a host.
- Some can remain dormant to overcome periods spent away from hosts.

(b) Similarities
- Both are heterotrophic.
- They can produce both sexually and asexually which are often associated with resistant stages.
- They usually produce offspring in large numbers.
- They absorb already simple and soluble food substances.
- Those that have digestive they are very simple in nature.

Differences
- Parasites derive their foods from living organisms while saprophytes derive their foods from dead organisms.
- Parasites usually have specific hosts while saprophytes obtain food from a variety of dead organisms.
- Some parasites have many stages in their life cycle while saprophytes usually have single adult stage and spores.
- Parasites are plants and animal forms while saprophytes are largely fungi and bacteria.
- Parasites only strive in habitats of their respective hosts while saprophytes can survive in diverse habitats.
- Digestion is exhibited in only very few parasites while all saprophytes have to digest their food.

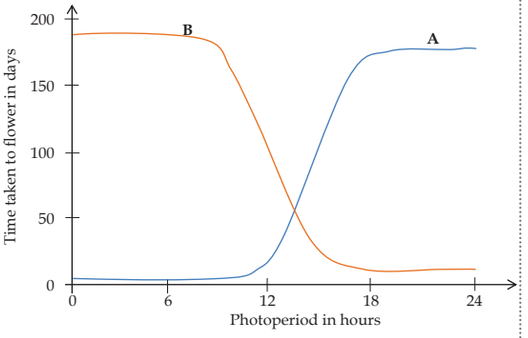
(c) Some are consumed as food, for example mushrooms.
- Some are used in industrial processes such as in tanning of leather and production of Vitamin C.
- Some are used in processing and producing yoghurt and cheese.
- Some are manipulated to decompose waste in sewage as a means of purifying water and in production of compost manure.
- Some are used in the manufacture of antibiotics such as penicillin.
- Yeast is used in brewing to obtain alcohol as well as in baking to produce bread.
- By decaying remains of plants and animals they recycle nutrients that enable humans be able to grow a variety of crops.

BIOLOGY PAPER 2 QUESTIONS (ABIO 006)

1. Different plants have been found to respond by flowering differently to varying wavelengths of light. In that regard two plant species were discovered to have a pigment that exists in two isomeric forms depending on how long the plants are consistently subjected to different light conditions. Their patterns of flowering in relation to absorbance of the two pigments were determined as follows:

Wavelength of light in nm		400	450	500	600	660	700	730	800
Light absorbance in arbitrary unit	**Pigment P1**	2.0	1.5	1.2	4.5	7.2	10.4	28.6	1.0
	Pigment P2	2.0	3.1	2.3	24.1	36.6	6.4	1.8	0.2
Average numbers of flowers per plant	**Plant A**	0	0	0	0	0	17	312	1
	Plant B	0	0	0	23	275	18	0	0

Graph shown below indicates flowering responses to day length of the two flowering plants A and B above when subjected to specified daylight duration per day.
Study the information provided in the table and the graph to answer the questions that follow.



a) Compare the:
i) light absorbance of the two plant pigments.

ii) average numbers of flowers produced by the plants per day.

b) i) What do pigments P1 and P2 represent in typical plants?

ii) Predict the light critical periods required for the two plant species to flower.

iii) What evidence did you base on to determine the critical periods in (b) (ii) above?

c) Which of the two plants is:
i) Long day plant?
ii) Long night plant?
iii) Use the information from the data provided and explain the isomeric nature of the pigments P1 and P2 in causing flowering.

d) i) Name the substance that is widely believed to be hormone that induces flowering in plants as a result of the relative abundance of the photochemical pigments P1 and P2.

ii) Where is the hormone in (d) (i) secreted from in a plant?

SECTION B

2. a) i) Briefly describe the four main ways by which organisms maybe distributed.

ii) Suggest the main factors that usually determine distribution of organisms.

b) Discuss the level of success or failure in the dispersal of plants in a habitat.

3. a) Show how the existence of mitochondria and chloroplasts in cells explain their continuous survival as organelles in eukaryotic cells as suggested by endosymbiotic theory of cell origin.

b) Give three evidences from the two organelles to confirm the theory in (a) above.

c) What are the roles of the components of eukaryotic plasma membranes?

d) Give four ways by which plant vacuoles may be important.

4. a) Without using diagram describe the structure of DNA molecule.

b) What are the evidences to show that DNAs are hereditary materials?

c) Protein synthesis requires prior synthesis of amino acids.
i) Where are amino acids produced in plants
ii) Outline the processes that result in formation of amino acids in plants.

5.(a) Explain the relationship between:
(i) size and surface area to volume ratio.
(ii) gaseous exchange and respiration.

(b) Discuss the difference in eficiency of gaseous exchange between bony fish and cartilaginous fish.

(c) Explain the differences between carbon dioxide and oxygen concentration in inhaled and exhaled air in mammals.

6.(a) Describe the following processes in flowering plants.
(i) Pollination.
(ii) Double fertilisation.

b) Compare alternation of generation in bryophytes with sexual reproduction in flowering plants.

c) State the reasons why flowering plants are more successful

LOOK OUT FOR A'LEVEL GEOGRAPHY, ECONOMICS, LITERATURE & IT TOMORROW