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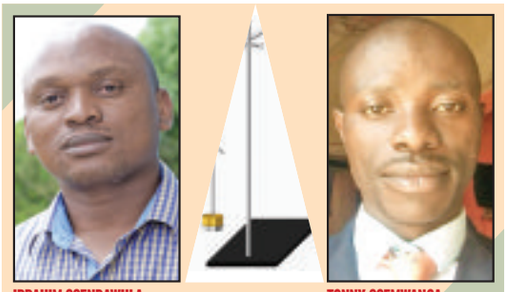
HOME SCHOOLING MATERIAL

PASS A LEVEL

BIOLOGY, PHYSICS AND GENERAL PAPER

YOUR GUIDE AWAY FROM SCHOOL

SOLUTIONS TO PHYSICS ISSUE 2



IBRAHIM SSENDAWULA
NABISUNSA GIRLS' SCHOOL

TONNY SSEMWANGA
MT ST HENRY'S H/S, MUKONO

4 (c) (i) Diffraction - is the spreading of waves beyond their geometrical shadows.
(ii) Factors affecting the extent of diffraction include:
-The wavelength λ of the waves being diffracted.
-The size of the object constituting the geometrical shadow i.e. size of the obstacle or size of the opening through which the waves pass.
(d) (i) Sound waves are refracted when they are passed through areas of different temperatures. The higher the temperature, the faster the speed of sound,

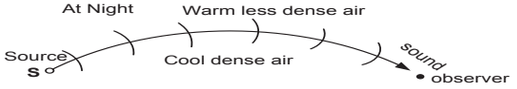
Refraction of sound during day

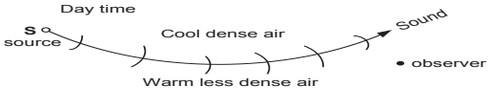
During day, the ground is hot and this makes the layers of air near the ground to be hot and less dense while those above the ground are generally cool and denser. . The wave fronts from the source are refracted away from the ground (earth's surface).

The intensity or loudness of the sound waves thus diminishes since the velocity of sound is proportional to the square-root of its absolute temperature.

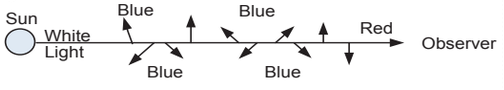
Refraction of sound during night

During night, the ground is cool and this makers layers of air near the ground to be cool and denser while those above (in the sky) to be warm and less dense. The wave fronts from the source are thus refracted towards the ground earth's surface) hence making it easier to hear sound waves over long distances.

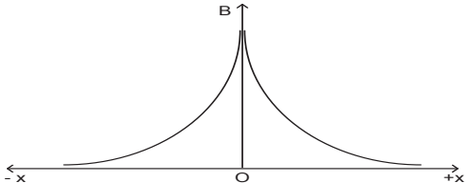




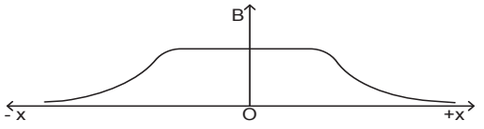
SECTION C:
(ii) The blue colour of the sky:
- Light is scattered easily when it meets a particle of a similar size to its own wavelength λ.
- White light from the sun as it passes through the atmosphere encounters dust particles and other tiny solid particles and water droplets which scatter the light into different component colours.
- Blue light with the shortest wavelength is scattered more and dominate the sky with the predominant blue colour while red light is almost un scattered and continues to the observer.



5. (a) (i) B due to straight wire carrying current I in air.



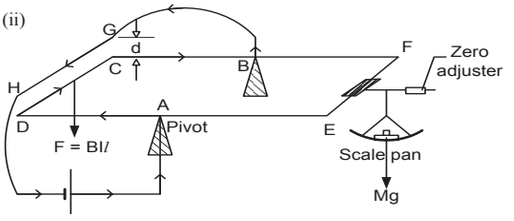
(ii) B due to a solenoid carrying current I in air.



Read about:
- the graph for the magnetic flux density at the centre of a circular coil
- definitions of magnetic flux density and magnetic flux

(b) (i) An ampere – is the steady current which when flowing in each of the two straight, parallel and infinitely long wires of negligible cross-sectional area placed 1m apart in a vacuum exerts a force of 2.0×10^{-7} N per metre length on each other.

(ii)

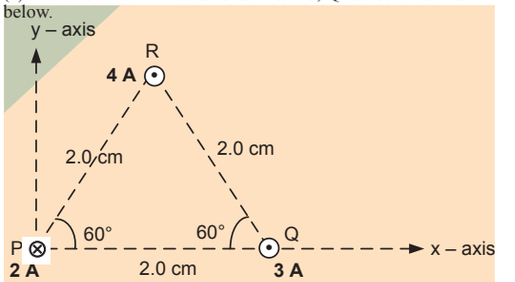


- The apparatus is set up as shown up as shown above.
- DCFE is a conducting frame such that AD = AE.
- With no current flowing, the zero screw (adjuster) is adjusted until the frame CDEF balances horizontally.
- The switch is closed and the arm CD is repelled downwards.
- Masses are added to the scale pan until the horizontal balance of the frame CDEF is restored.
- The value of the mass M in the scale pan is measured, together with the separation, d, between arms CD and GH. Now since AE = AD, and CD = l
- The value of the current I is calculated from

$$I = \sqrt{\frac{2\pi mgd}{\mu_0 l}}$$

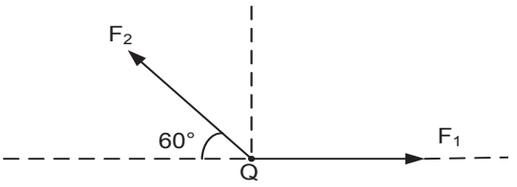
where $\mu_0 = 4\pi \times 10^{-7}$ H m^{-1}

(c) consider a cross section of the wires P, Q and R as shown below.



Let, F_1 = force per metre on wire Q due to wire P,
F_2 = force per metre on wire Q due to wire R,

Force on Q due to P	Force on Q due to R
$F_1 = \frac{F_{PQ}}{l} = \frac{\mu_0 I_P I_Q}{2\pi d}$	$F_2 = \frac{F_{RQ}}{l} = \frac{\mu_0 I_R I_Q}{2\pi d}$
$F_1 = \frac{4\pi \times 10^{-7} \times 2 \times 3}{2\pi \times 2.0 \times 10^{-2}}$	$F_2 = \frac{4\pi \times 10^{-7} \times 4 \times 3}{2\pi \times 2.0 \times 10^{-2}}$
$F_1 = 6.0 \times 10^{-5}$ N m^{-1} from Q in the +x - direction	$F_2 = 12.0 \times 10^{-5}$ N m^{-1} from Q towards R
F_1 is a repulsive force	F_2 is an attraction force



$\sum F_x = F_1 - F_2 \cos 60°$	$\sum F_y = F_2 \sin 60°$
$= (6.0 - 12.0 \cos 60°) \times 10^{-5}$	$= 12.0 \times 10^{-5} \sin 60°$
$F_x = 0.0$ N m^{-1}	$F_y = 1.04 \times 10^{-4}$ N m^{-1}

∴ resultant force per metre at Q, $F_Q = \sqrt{(F_x^2 + F_Y^2)}$

$= 1.04 \times 10^{-4}$ N m^{-1} in the + y direction.

(d) (i) Electromagnetic moment – is the magnetic torque experienced by a current carrying conductor (coil) placed with its plane parallel to a uniform magnetic field of flux density one tesla (1T).
SI unit – is ampere metre squared (A m^2)

Torque τ = magnetic moment ,m ,

when $\alpha = 0^0$ and $B = 1$ T

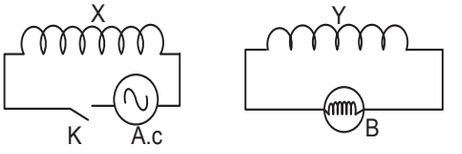
But $\tau = BINA\cos\alpha \Rightarrow m = NIA$.

NB
Electromagnetic moment is sometimes called magnetic moment of a current carrying coil or magnetic dipole moment of the coil.

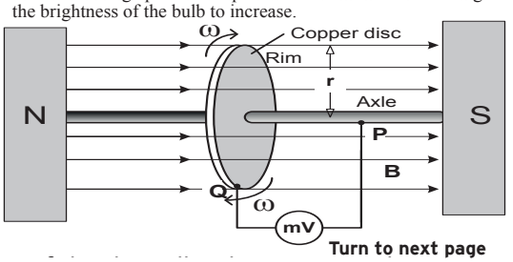
(ii) I = 5.0A, N = 50 turns,
A = (2.0×4.0) cm^2 = 8.0×10^{-4} m^2
B = 0.80T, θ = 60°,
thus B parallel to the plane is B cos θ
Magnetic moment, m = IAN.
= $5.0 \times 8.0 \times 10^{-4} \times 50$
= 0.20 A m^2 perpendicular into the plane of the coil

6. (a) (i) Electromagnetic induction – is the production of an induced e.m.f. in a coil, (conductor or circuit) whenever the magnetic flux linked with it changes.
(ii) Self-induction is a process in which an e.m.f. is induced in a circuit due to changing current flowing in the same circuit.
While;
Mutual induction is a process in which an e.m.f. is induced in a circuit due to changing current flowing in a nearby circuit.

(b)



(i) When switch K is closed, bulb B is seen to light up.
A changing magnetic flux linking coil Y due to changing current in coil X causes an induced e.m.f. to be induced init thus inducing a current that flows in the circuit causing the bulb to light up.
(ii) Inserting iron rod in coil X, increases or enhances the magnetic flux linking coil Y from coil X.
This increases the magnitude of the induced e.m.f. linking coil Y thus increasing the induced current flowing through the circuit of coil Y. A large power dissipation occurs in the bulb causing the brightness of the bulb to increase.



Turn to next page

SOLUTIONS TO PHYSICS ISSUE 2

In one revolution of the disc, all radii cut across the magnetic flux between P and Q,
the magnetic flux ϕ, is given by:

$\phi = BA$

$$\frac{d\phi}{dt} = B\left(\frac{dA}{dt}\right)$$

If the disc makes f , revolutions in one second,

then the rate of cutting of the magnetic flux $\frac{d\phi}{dt} = B\pi r^2 \times f$

By Faraday's law, this is the magnitude of induced e.m.f. E Induced between the axle and the rim.

$$\therefore E = \frac{d\phi}{dt} = B\pi r^2 f$$

$$\Longrightarrow E = B\pi r^2 f$$

Alternatively, the speed of the wheel at the axle u = 0 ms^{-1} and the speed of the wheel at the rim = v ms^{-1}

$$\text{average speed, } v_a = \left(\frac{u+v}{2}\right) = \frac{v}{2} = \frac{r\omega}{2}$$

But, induced e.m.f. = Blv_a, where, l = r

$$E = Brv_a$$

$$E = Br\left(\frac{r\omega}{2}\right) \text{ but } \omega = 2\pi f$$

$$\therefore E = B\pi r^2 f$$

(ii) $f = 1200 \text{ rev. min.}^{-1} = \frac{1200}{60} = 20$ Hz

$r = 1.0 \times 10^{-2}$ m

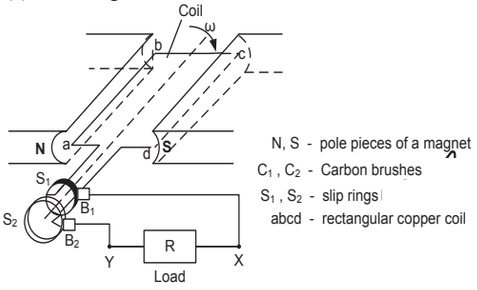
$A = \pi r^2 = 3.14 \times (1.0 \times 10^{-2})^2 = 3.14 \times 10^{-4}$ m^2

$E = B\pi r^2 f$

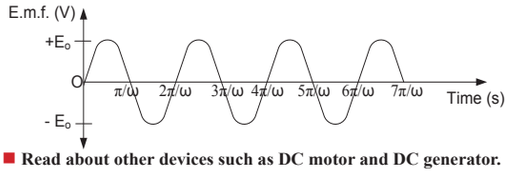
$= 2.5 \times 10^{-2} \times 3.14 \times 10^{-4} \times 20$

$\therefore E = 1.57 \times 10^{-4}$ V

(d) An a.c. generator.



- When the coil is rotated about an axis through its centre at an angular speed ω, an e.m.f. is induced across its ends attached to the slip rings S_1 and S_2 respectively.
- When the circuit is completed via a load resistance R, an induced current flows from a to b and c to d in the coil and across R from X towards Y.
- At the vertical position of the coil (after 90° turn) no cutting of the magnetic flux occurs and e.m.f. becomes zero.
- The momentum of the coil carries it past this position and cutting of the magnetic flux resumes causing an induced e.m.f. and current to be generated again whose value increases to maximum and again falls to zero.
- After half a revolution (180° turn of the coil), the induced e.m.f. reverses direction and induced current flows through the coil in opposite direction; i.e., from d to c on the left and b to a on the right hand side of the coil, and through R from Y towards X. However the direction of rotation of the coil remains the same (clockwise).
- The process then repeats itself several times per second, enabling an alternating voltage $E = E_o \sin \omega t$, of the shape shown below to be generated across the terminals of the coil.



■ **Read about other devices such as DC motor and DC generator.**

7.(a) R.m.s value of alternating voltage – is the steady voltage which when applied across opposite faces of a resistor would cause electrical energy conversion to other forms in it, at the same rate as the alternating voltage.

(b) (i) A pure inductor – is one that has negligible resistive opposition (resistance) to the passage of changing current through it.

(ii) $X_L = \omega L = 2\pi fL$

$= 2 \times 3.14 \times 60 \times 0.4$

$= 150.72\ \Omega$

(iii) $X_L = \frac{V_{rms}}{I_{rms}}$

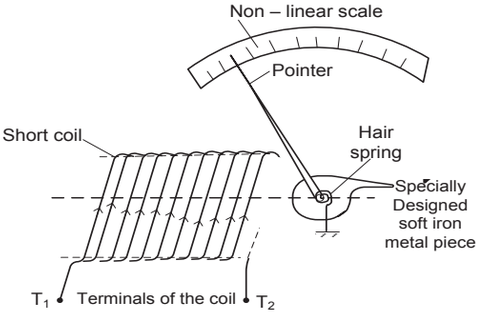
$V_{rms} = I_{rms} \times X_L$

$= \frac{I_o}{\sqrt{2}} \times X_L$ but $I_o = 2.0$A

$= \frac{2.0}{\sqrt{2}} \times 150.72$

$= 213.15$ V

(c) Moving iron ammeter (attraction type)



Current I to be measured is passed into the coil via the terminals T_1 and T_2.

A magnetic field is created inside the coil, and the soft iron piece near the open end of the coil gets attracted towards the coil with a force approximately proportional to the square of the current through the coil.

The sharpest point of the soft iron metal piece receives the greatest force of attraction and rotates towards the coil about its pivot, and thus causing the pointer attached to it also to turn and move over the scale through an angle θ until stopped by the restoring torque provided by a pair of hair springs.

The deflection θ is proportional to the mean of the square current; i.e., $\theta \alpha < I2 >$ hence the scale is non-linear (square) scale.

(d)(i) $I = I_o \sin 2\pi ft$ $\quad I^2 = I_o^2 \sin^2 2\pi ft$

Instantaneous Power $\quad P = I^2R$

$= I_o^2R(\sin^2 2\pi ft)$

Average power, <P> $= I_o^2R<\sin^2 2\pi ft>$

$= \frac{1}{2}I_o^2R$ (since $<\sin^2 2\pi ft>_T = \frac{1}{2}$)

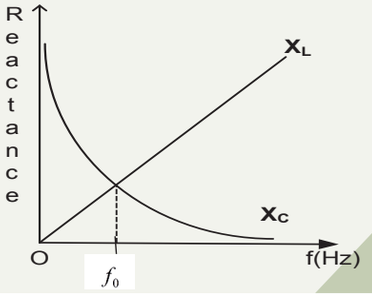
(ii) At resonance, $X_c = X_L$

$$\frac{1}{2\pi fC} = 2\pi fL$$

$$f^2 = \frac{1}{4\pi^2 LC}$$

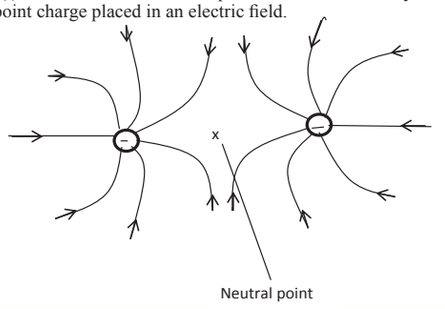
$$\therefore \text{resonant freq. } f_o = \frac{1}{\sqrt{LC}}$$

(iii)



8. (a) (i) Electric field line – is the path or direction taken by a +1C point charge placed in an electric field.

(ii)



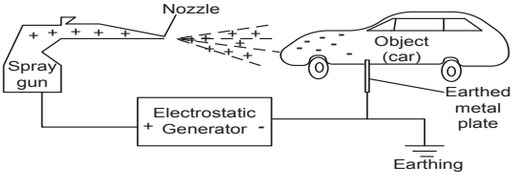
Note the following:

- Direction of the field lines should be towards the charge
- Number of field lines must be the same from each charge
- Neutral point x, must be midway

(b) (i) Coulomb's law states that the force acting on two point charges in space is directly proportional to the product of the magnitude of the charges and inversely proportional to the square of their distance of separation.

(ii) How the oil spray works:

- The spray gun designed to produce tiny droplets of the oil paint has one of its terminals connected to the metal panel which is earthed and the other to the positive terminal of a generator.
- Highly pressured oil droplets pass through the nozzle of the gun and get charged positively by friction and influence the generator when connected to the positive terminal of the generator.
- The charged droplets then get attracted to the body of the object being sprayed e.g. car and this creates uniform coating of paint on the body of the object.
- The droplets also travel along the lines of force of the field so as to reach hidden parts of the body.



(c) (i) Diameter, d = 0.1 mm, charge $Q = 1.0 \times 10^{-10}$ C

separation r = 1mm

$$F = k\frac{Q^2}{r^2} = \frac{9.0 \times 10^9 \times (1.0 \times 10^{-10})^2}{(1.0 \times 10^{-3})^2} = 9.0 \times 10^{-5} \text{N (repulsive)}$$

(ii) From F = ma, acceleration $a = \frac{F}{m}$

$$a = \frac{9.0 \times 10^{-5}}{m}$$

where, $m = V \times \rho = \frac{4\pi r^3}{3} \times \rho$

$$= \frac{4\pi (0.05 \times 10^{-3})^3}{3} \times 850$$

$$= 4.45 \times 10^{-10} \text{kg}$$

$$\therefore a = \frac{9.0 \times 10^{-5}}{4.45 \times 10^{-10}} = 2.022 \times 10^5 \text{ N away from each other.}$$

(d)(i) Energy stored in a capacitor $E = \frac{1}{2}CV^2 = \frac{\varepsilon_o A}{2d}V^2$

(ii) Using, $E = \frac{1}{2}CV^2 = \frac{\varepsilon_o A}{2d}V^2$ where d = 1.0 km = 1000 m

V = 100 kV = 100,000 V and A = 50 $km^2 = 50 \times 10^6$ m^2

$$\therefore E = \frac{8.85 \times 10^{-12} \times 50 \times 10^6 \times (10^5)^2}{2 \times 10^3} = 2212.5 \text{ J}$$

$E = 2.21 \times 10^3$ J

9. (a) (i) Electric field intensity is the force exerted on a positive charge of one coulomb placed in an electric field.

(ii) Every conductor is considered as an equi-potential surface. Electric field lines connect points of different potentials, thus if the field lines were at other angles to the surface other than 90° they would cancel out each other, since electric force on any charge acts along the direction of the field.

Electric field lines do not cross each other, so this can only be achieved if they are normal to the surface of the conductor.

(b) (i) Keeping other factors constant one of the plates of the charged capacitor is connected to the cap of the G.L.E and the divergence θ_1 is noted.

A dielectric material is then placed between the plates of the

SOLUTIONS TO PHYSICS ISSUE 2

capacitor and the new divergence θ_2 is noted.
Its observed that $\theta_2 < \theta_1$

From $C = \frac{\varepsilon A}{d} = \frac{Q}{V}$ but $\theta \alpha V \Rightarrow C \propto \frac{1}{V}$ thus a

reduction in V leads to a reduction in the divergence hence an increase in capacitance.
$C \alpha \varepsilon$, showing capacitance, increases
Showing that $C_2 > C_1$, the capacitance of the capacitor is greater when the dielectric is inserted between the plates of the capacitor.
(c) (i) When a capacitor is connected across a source of e.m.f, work is done due to:-

- energy involved in removing negative charge from one plate against electrostatic attraction for the opposite positive charge on the plate.
- energy involved in depositing the negative charge on the negatively charged plate against repulsion.
- energy involved in moving electrons against collisions between electrons and the lattice atoms or ions.

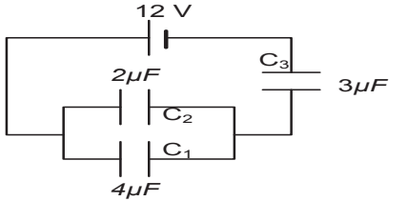
(ii) Using $\Delta\omega = V\Delta Q$ But $V = \frac{Q}{C}$

$$\omega = \int_o^Q V dQ$$

$$= \int_o^q \frac{Q}{C} dQ$$

$$\omega = \frac{Q^2}{2C}$$

(d)



The effective capacitance of the parallel network $C' = C_1 + C_2$

$C' = 4 + 2 = 6\mu F = 6.0 \times 10^{-6} F$

The effective capacitance of the series network,

$\frac{1}{C} = \frac{1}{C'} + \frac{1}{C_3}$

$= \frac{1}{6} + \frac{1}{3}$

$\therefore C = 2.0\ \mu F$

Total charge in the system, $Q = CV = 2.0 \times 10^{-6} \times 12$

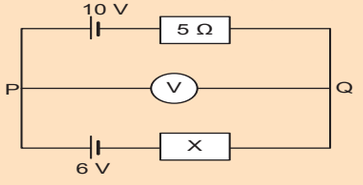
$= 24.0 \times 10^{-6}$ C or 24 μC

P.d. across 2μF charge, $V' = \frac{Q}{C'} = \frac{24.0 \times 10^{-6}}{6.0 \times 10^{-6}}$

$\therefore V' = 4.0$ V

10. (a) (i) E.m.f. – is the energy used (or work done) to move one coulomb of charge around a complete circuit which includes the source of e.m.f. itself.
Or; Is the terminal p.d across a cell or battery (the source) on an open circuit.
(ii) volt – is the p.d across opposite faces of a resistor of resistance1 Ω when the current flowing through it is 1 A.
(iii) ohm – is the resistance across opposite faces of the material having a p.d of 1 volt when a current of 1 ampere flows through it.

(b) Effective resistance of the circuit R = (5 + X) Ω



Effective e.m.f. of the circuit, E = 10 – 6 = 4 V

$\therefore$ The net current flowing in the circuit, $I = \frac{E}{R} = \frac{4}{(5+x)}$

Either $V_{PQ} = 10 - 5I = 10 - \frac{20}{(5+x)} = 8.0$

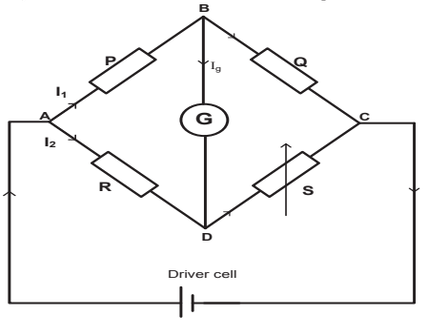
Or $V_{PQ} = 6 + I X = 6 + \frac{4 \times x}{(5+x)} = 8.0$

$\frac{20}{(5+x)} = 10 - 8.0 \Rightarrow 5 + x = 10$

$\therefore$ x = 5.0 Ω

(c) (i) Temperature coefficient of resistance: Consider a material whose resistance at 0^0C is R^0, then, temperature coefficient of resistance is the fraction of R^0 by which the resistance of a material increases per kelvin temperature rise.
Or It is the change in resistance of a material per degree (or kelvin) rise in temperature divided by the resistance of the material at 0° C.
(ii) When metals are heated, the atoms vibrate about their equilibrium positions with larger amplitudes.
More frequent collisions result, causing the number of charges (electrons) crossing any given section of the conductor to reduce, hence current flowing also reduces.
A reduction in the current flowing causes the resistance to increase. Thus resistance increases with increase in temperature.
In **semi-conductors**, increase in temperature liberates more electrons from the valency band to the conduction band.
This increases the available charge carriers thus relatively increasing the number of electrons crossing a given section of the material
As a result, current flowing through the semi-conductor increases hence reducing resistance .
Therefore, increase in temperature of the semi-conductor leads to a reduction in resistance hence the negative temperature coefficient of resistance.

(d) (i) Using the circuit diagram below, P, Q and R are standard resistors, while S is a variable resistance. $\Rightarrow i_g = 0$



When S is adjusted until the centre zero galvanometer G shows no deflection, same current I_1 passes through P and Q. Similarly, at balance point, same current I_2 flows through R and S.

The p.d across **P** = p.d across **R**

i.e. $I_1 P = I_2 R$ ..... (i)

The p.d across **Q** = p.d across **S**

$I_1 Q = I_2 S$ ..... (ii)

Equation (i) ÷ (ii)

$\Rightarrow \frac{I_1 P}{I_1 Q} = \frac{I_2 R}{I_2 S} \Rightarrow \frac{P}{Q} = \frac{R}{S}$; This expression

is the balance condition of a wheatstone bridge.

(ii) Using $R_\theta = R_0(1 + \alpha\theta)$

When $\theta = 0^0$C, $3 = R_0(1 + \alpha \times 0)$

$3 = R_0$ ---------(i)

When $\theta = 90^0$C, $R_{90} = R_0(1 + 90\alpha)$

$20 = 3(1 + 90\alpha)$----------(ii)

Solving equations (i) and (ii) gives,

$$\alpha = \frac{1}{90}\left(\frac{20}{3} - 1\right)$$

$\therefore \alpha = 6.30 \times 10^{-2}\ \Omega$

Also read about:

- The terms resistivity, conductivity, conductance , resistance and their units
- The factors that affect resistance of a material (temperature, $= \rho \frac{l}{A}$, mechanism of electron flow in metals, drift velocity)
- The potentiometer bridge (balance point (standardising/ calibrating it), its uses, the errors and how to reduce them)
- The metre bridge (balance condition and its uses)
- Wheatstone bridge (balance condition and its uses)
- Charging materials by rubbing, contact and induction
- The gold leaf electroscope, its parts and uses
- The corona discharge, charge distribution on conductors of different shapes, ice pail experiment to verify that no charge resides inside a hollow conductor, the act of lightning and the lightning conductor, the Van De Graff generator, application of electrostatics in (painting, and electrostatic printers)
- Explain the observations (when you remove a silk cloth from your body, sparks are heard and in cases of darkness, light sparks are seen, when a Perspex ruler is rubbed with hair, it can attract small pieces of paper.)
- Equipotential surfaces, why field lines are always perpendicular to the surface
- Electric fields (Electric field lines, Coulomb's law $(F = \frac{KQ_1Q_2}{R^2}; k = 9X10^9)$, when this force is repulsive or attractive, resolving and determining the resultant force)
- Electric field strength/ intensity, electric potential, similarities between the electric field and the gravitational field
- Capacitors (capacitance, capacitors in parallel and series, uses of capacitors, energy stored in capacitors, dielectric material, dielectric constant and effect of inserting a dielectric material between the plates of a capacitor, the formulae $C = \frac{Q}{V} = \frac{\varepsilon_0 A}{d}$, $E = \frac{1}{2}\dot{C}V^2 = \frac{1}{2}\frac{\varepsilon_0 A}{d}\dot{V}^2$

Turn to next page

NN Friday, May 29, 2020

PASS A'LEVEL

PHYSICS PAPER 1 (APHY 003)

SECTION A.

1. (a) (i) Distinguish between fundamental and derived quantities. State any two examples of each.
(ii) The velocity V of sound travelling along a rod made of material of Young's modulus. Y and density, ρ is given by

$$V = \sqrt{\frac{Y}{\rho}}$$

Show that the formula is dimensionally consistent.

(b) (i) Account for the existence of intermolecular forces.
(ii) Sketch a graph of potential energy against separation of two molecules in a substance and explain the main features of the graph.

(c) A uniform rod AB weighing 100kg and 0.75 m long is hinged to a vertical wall at end A and held horizontally by a stretched thin wire of diameter 0.8 mm fixed at end B and at C on the vertical wall,1.0m above A. If the wire was initially 1.23 m long, find:
(i) the tension in the wire.
(ii) Young's modulus for the wire.

2. (a) (i) Define relative density.
(ii) With the aid a diagram(s), describe how you would measure the relative density of a liquid using Archimedes' principle and the principle of moments.

(b) (i) Define surface tension and state its dimensions.
ii) Describe Jaeger's experiment of determininig surface tension of a liquid.

(iii) Explain the variation of surface tension of a liquid with temperature.

(c) Mercury is poured into a glass U-tube with vertical limbs of diameters 3mm and 10mm respectively. If the angle of contact between mercury and glass is 120^0 and the surface tension of mercury is 0.4 Nm^{-1}, calculate the;
(i) surface tensional force in the wider tube.
(ii) difference in levels of mercury.
(Take the density of mercury = 1.36 x 10^4 kgm^{-3})

3. (a) State Newton's laws of motion.
(b) Describe the principle of rocket propulsion.
(c) A bullet of mass 20g is fired at short range into a block of wood of mass 980g resting on a smooth horizontal surface and attached to a spring of force constant 100Nm^{-1}. The bullet remains embedded in the block while the spring is compressed by a distance of 4.8cm.
Find the;
(i) elastic potential energy of the compressed spring,
(ii) speed of the bullet just before collision with the block.

(d) (i) State the laws of friction.
(ii) Describe an experiment to determine the coefficient of static friction.

4. (a) (i) What is meant by escape velocity?
(ii) A satellite of mass 100 kg revolves round the earth in a parking orbit at a height h above the earth's surface. Calculate the value of h. (radius of earth = 6.4 × 10^6 m)

(b) (i) Define angular velocity and centripetal acceleration.
(ii) Derive the expression for the centripetal force on a mass m moving with uniform speed v in a circular path of radius r.

(c) A car travels round a bend banked at an angle of 24^0. If the radius of curvature of the bend is 60m and the coefficient of friction between the tyres of the car and the road surface is 0.25, calculate the maximum speed at which the car can negotiate the bend without skidding.

(d) (i) State Hooke's law.

(ii) Outline four measurements carried out in determining young's modulus of the material.

(iii) State two limitations of the accuracy in verifying Hooke's law.

SECTION B

(a) (i) State Charles's law.
(ii) Describe an experiment to verify Charles's law.

(b) (i) State the conditions necessary for a reversible isothermal process.

(ii) A fixed mass of gas at a pressure P_1 and volume V_1 expands isothermally to a pressure P_2 and volume V_2. Derive an expression for the work done by the gas.

(c) A gas of volume 2 litres at a temperature of 27^oC and pressure of 1.5 × 10^5Pa is heated at constant pressure until its volume doubles. It is then cooled at constant volume back to its original temperature before finally being compressed isothermally to its original volume.
(Gas constant, R = 8.31 J $mol^{-1}K^{-1}$)
(i) Draw a p-V diagram of the whole cycle
(ii) Find the net work done by the gas.

(d) The pressure P of an ideal gas of density ρ is given by

$$P = \frac{1}{3}\rho\overline{c^2}$$ where $\overline{c^2}$ is the mean-square speed of its molecules.
Using this expression, show Avogadro's hypothesis.

6. (a) (i) What is meant by a saturated vapour.
(ii) Sketch a pressure versus volume curve for a real gas undergoing compression below its critical temperature.
(iii) Explain the main features of the curve (a) (ii).

(b) (i) State Dalton's law of partial pressures.
(ii) Two identical bulbs containing a gas at a pressure P_1 and temperature T_1 are connected by a capillary tube. When one of the bulbs is immersed in a bath at a temperature T_2, the pressure becomes P_2.
Show that the temperature of the bath is given by

$$T_2 = \frac{P_2 T_1}{2P_1 - P_2}.$$

(c) (i) Define the term specific latent heat of vaporisation.
(ii) An electrical heater rated 500W is immersed in a liquid of mass 2.0kg contained in a large thermos flask of heat capacity 840 JK^{-1} at 28^oC. Electrical power is supplied to the heater for 10 minutes. If the specific heat capacity of the liquid is 2.5 × 10^3 $Jkg^{-1}K^{-1}$, its specific latent heat of vaporisation is 8.54 × 10^3 Jkg^{-1} and its boiling point is 78^oC, estimate the amount of liquid which boils off stating any assumptions made.

(d) Describe how the temperature of a liquid bath may be measured using a platinum resistance thermometer.

7. (a) (i) Define the term thermal conduction.
(ii) Explain the mechanism of heat transfer in metals.
(iii) Calculate the quantity of heat that flows through a copper conductor of thickness 2cm and cross sectional area $4cm^2$ in 2 minutes setting up temperatures of 60^0C and 20^0C across its ends.
(Thermal conductivity of copper = 400 $Wm^{-1}K^{-1}$)

(b) (i) What is a black body?
(ii) Draw sketch graphs to show the variation of relative intensity of black body radiation with wavelength for different temperatures.

(iii) Explain the appearance of a metal ball placed in a dark room when its temperature is progressively raised from room temperature to just below melting.

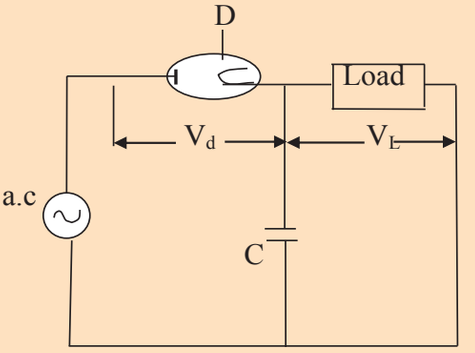
(c) A heating element in the form of a cylinder 30 cm long and 1.5 cm in diameter has an output of 1.8 kW. If its radiation is 85% that of a black body, find its temperature.
(Stefan's Boltzmann's constant, σ = 5.7 10^{-8} Wm^{-2} K^{-4})

(d) A beam of 2 × 10^{22} Nitrogen atoms, each of mass 2.32×10^{-26} kg is incident normally on a wall of a cubical container of edge 4.5 cm. The beam is reflected through 180^o. If the mean speed of the atoms is 500ms^{-1}, find the pressure exerted by the Nitrogen gas.

SECTION C

8. (a) (i) Sketch the I-V characteristic for gaseous conduction.
(ii) Explain the main feature of the curve.

(b) A valve diode D was connected to rectify a.c supply to a load as shown below. C is a capacitor.



(i) State the purpose served by the capacitor C.
(ii) Explain the effect on the p.d's V_d and V_L of introducing a little mercury vapour in the vacuum of D.

(c) (i) Draw a labelled diagram of a cathode ray oscilloscope (C.R.O).
(ii) Describe how an alternating p.d may be measured using a C.R.O .

(d) In a Millikan's oil drop experiment a single negatively charged drop of radius 6 x 10^{-6}m was found to fall under gravity at a terminal velocity of 0.004cm s^{-1} and to rise at 0.012cm s^{-1} when a field of
2 x 10^5 Vm^{-1} was suitably applied. Given that the viscosity of the medium was 2.122 x 10^{-5} Nsm^{-2} .
Determine the number of electrons on the drop.

9. (a) (i) what is meant by photoelectric emission?
(ii) State the characteristics of photoelectric emission.

(b) With use of a well labelled diagram, describe a simple experiment to demonstrate photoelectric emission.

(c) Sodium has a work function of 2.3eV and it is illuminated by light of wavelength 5.0×10^{-7}m.
Find the;
(i) Threshold frequency of sodium.
(ii) Maximum velocity of the photoelectrons emitted.
(iii) Stopping potential with light of this wavelength

(d) (i) Explain any one application of photoelectric emission.
(ii) Draw a sketch graph of photo-current against potential difference across a photocell for two different intensities but the same frequency of incident radiation.

10. (a). (i) What is specific charge?
(ii) State the S.I unit of specific charge.
(iii) Describe with the aid of a diagram how specific charge of positive ions can be determined using a mass spectrometer.

(b). A beam of singly ionized carbon atoms passes undeflected through a region of crossed magnetic and electric fields of 0.10 T and 1.0x$10^4$$NC^{-1}$ respectively.
When it enters a region of uniform magnetic field, it is deflected through an arc of radius 0.75m.
Calculate the magnetic flux density of this field.
(Mass of carbon atom is 2.0x10^{-26}kg)

(c) (i) Draw a graph to illustrate the variation of Ionisation current and p.d across an Ionisation camber and explain its main features
(ii). Explain how Ionisation chamber can detect ionizing radiation.

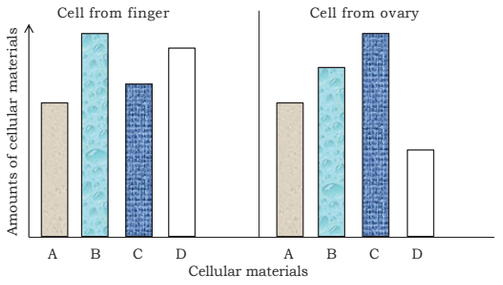
BIOLOGY PAPER 1 (ABIO 003)

SECTION A

1. Which form of learning is acquired after continuous repetition of a non-reinforced stimulus?
A. Insight learning.
B. Imprinting.
C. Habituation.
D. Exploratory learning.

2. The graphs in figures 1 and 2 below show the amounts of cellular materials **A**, **B**, **C** and **D** in different cells extracted from cells of different body parts of the same organism. Which of them is hereditary material?

Figure 1 **Figure 2**

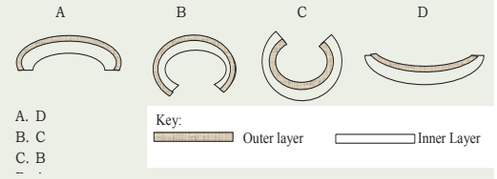


3. A healthy person at rest but respiring on both carbohydrate and fat would most likely have respiratory quotient of
A. 0.7
B. 0.85
C. 1.0
D. 1.2

4. Which body defence is the best in reducing your risk of getting Covid-19?
A. High number of cilia in the lining of respiratory passages to waft away the virus.
B. High amounts of amino acids for synthesizing the required enzymes to breakdown the virus.
C. Ability to rapidly clot blood and block the spread of the virus from its entry point.
D. Tough layer of keratin on the skin to prevent entry of the virus to the inner tissues.

5. Figure 3 below shows results obtained from an investigation on the effect of different concentrations of sucrose solution on strips of fresh pawpaw leaf stalks. Which strip was placed in most concentrated sucrose solution?

Figure 3



A. D
B. C
C. B
D. A

6. During phylogenetic classification:
A. Only physically observable characteristics are used.
B. Evolutionary relationships among organisms are used.
C. Only organisms that interbreed to form viable offspring are considered.
D. Organisms with dissimilar features but closely related.

7. Which of the following is the role of Luteinising hormone during spermatogenesis in male humans?
A. Stimulates sertoli cells to complete development of spermatozoa from spermatids.
B. Stimulates sertoli cells to secrete inhibin hormone in blood.
C. Stimulates Lyedig cells to secrete testosterone hormone in blood.
D. Inhibits anterior pituitary gland from secreting follicle stimulating hormone in blood.

8. Which of the following processes are restricted to mitosis only?

THE TEACHERS

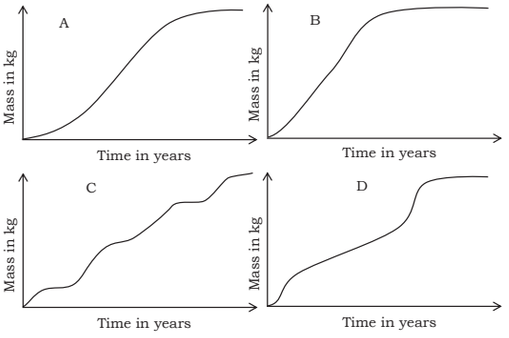
OJOK DEOGRACIOUS,
TRINITY SENIOR ACADEMY, BWEBAJJA

BEN OCAN,
ST MARY'S COLLEGE, KISUBI

A. Formation of cancerous tissue in alveoli and secretion of antibodies in b - lymphocytes.
B. Ovulation and formation of mucus from goblet cells.
C. Formation of cancerous tissue in alveoli and flowering in cowpeas plant.
D. Spermatogenesis in testes and healing of wound.

9. Figure 4 shows graphs for growth curves of different organisms. Which of them **best** represents human growth curve?

Figure 4



10. A large surface area of the cristae in the mitochondria is important for
A. Energy radiation
B. Protein synthesis
C. Enzyme reaction
D. Gaseous exchange

11. Which of the following is the correct sequence of movement of limbs in a previously stationary tetrapod after moving forward the right hind limb?
A. Left hind, left fore and right fore.
B. Right fore, left fore, and left hind.
C. Left fore, left hind, and right fore.
D. Right fore, left hind and left fore.

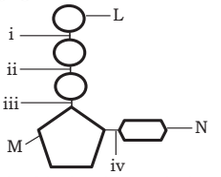
12. Which one of the following sets of processes is most likely to produce new species?
A. Genetic crossing over, independent assortment, mutation, random fusion of gametes.
B. Genetic crossing over, independent assortment, mutation, DNA replication.
C. Mutation, genetic crossing over, recovering from viral disease, random fusion of gametes.
D. Genetic load, independent assortment, mutation, random fusion of gametes

13. Which of the following statements is inconsistent in relation to human sperm cell?
A. The acrosome contains a lytic agent which dissolves the egg membrane during fertilization.
B. The nucleus is haploid and contains circular DNA.
C. The axial filament runs through its centre and consists of the 9+2 fibre arrangement.
D. The middle piece contains numerous mitochondria to supply the necessary energy for propulsion.

14. When the ventricular contractions reach their maximum
A. Semilunar valves open while atrio-ventricular valves close.
B. Semilunar valves close and atrio-ventricular valves open.
C. Both semilunar and atrio-ventricular valves close.
D. Both semilunar and atrio-ventricular valves open.

Figure 5 shows a molecule of ATP. Study and use it to answer questions 10 and 11.

Figure 5



15. Which of the bonds provide the immediate energy the ATP is hydrolyzed?
A. i
B. ii
C. iii
D. iv

16. Which of the chemical components of the ATP illustrated in figure 4 are also used as components of DNA?
A. L and M
B. L and N
C. M and N
D. L, M and N

17. If one individual out of a population of 10,000 people suffers from Huntington disease caused by a dominant autosomal allele. Using Hardy-Weinberg principle, what if the frequency of heterozygotes in the population.
A. 0.0001.
B. 0.01.
C. 0.99.
D. 0.0198.

18. The effect of the presence of calcium ions in the sarcoplasm on the troponin and tropomyosin is
A. Blocking of the myosin binding site by troponin and tropomyosin.
B. Exposure of myosin binding site on the actin filament.
C. Detachment of the myosin head from its binding site
D. Binding of myosin on the actin filament.

19. The table 1 below shows varition in the relative thickness of medulla of the kidney with the maximum urine concentration for different mammals.

Mammal	Relative thickness of medulla	Maximum urine concentration/ abitrary units
A	1.0	52
B	1.3	110
C	5.2	300
D	7.8	550

Which of the mammals is most likely to be an inhabitant of a desert?
A. B
B. C
C. D
D. A

20. Which of the following hormone secretion is stimulated by presence of another hormone in blood?
A. Insulin and Luteinising hormone.
B. Glucagon and follicle stimulating hormone.
C. Adrenaline and gastrin.
D. Oestrogen and Luteinising hormones

21. In an experiment to investigate the relationship between tips of shoots and phototropism, a student treated four potted seedlings as below and enclosed each in a card box blackened inside with only one hole.

Turn to next page

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BIOLOGY PAPER 1 (ABIO 003)

I. Cut off the tip of the shoot.
II. Cut of the tip of the shoot and replaced it with a polythene in between it and the lower part of the shoot.
III. Attach it to a klinostat.
IV. Cut of the tip of the shoot and replaced it with agar block in between it and the lower part of the shoot.
In which of the setups did the shoot bend towards the unidirectional source of light as it grows.
A. I
B. II
C. III
D. IV

22. Which of the following reactions occurs in organisms to resist changes in pH after addition of little amounts of acids?
A. HCO_3^- + H+ H_2CO_3
B. HCO_3^- + OH- $CO3^{2-}$ + H_2O
C. HCl H^+ + Cl-
D. NaCl Na^+ + Cl-

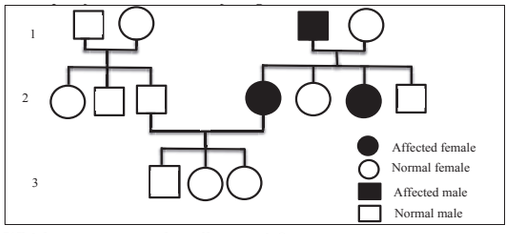
23. Utricle and saccule respond to:
A. Vertical movements only
B. Lateral movements only
C. Vertical and lateral movements respectively
D. Lateral and vertical movements respectively

24. Lock and key hypothesis of enzyme action differ from induced fit hypothesis in because it suggests :
A. Enzyme active site adjusts according to the substrate that gets in contact with the enzyme.
B. The shape of the active site is similar to the shape of the substrate.
C. The shape of the active site is complementary to the shape of the substrate.
D. High heat denatures the enzyme.

25. The main function of cortical reaction is
A. Facilitates sperm penetration of the ovum.
B. Activates the sperm and the ovum prior to fertilisation.
C. Enables survival of the sperm in the female reproductive system.
D. Ensures fertilisation of the ovum by only one sperm.

26. Which of the following is the characteristic used to classify fungi into different phyla?
A. Form of storage of excess carbohydrates.
B. Whether it is unicellular or multicellular.
C. The type of reproductive structures.
D. The component of the cell wall.

27. Figure 6 below shows the pattern of inheritance of a genetic disorder called phenylketonuria in a family linage.



Which gene causes phenylketonuria?
A. Homozygous recessive gene.
B. Homozygous dominant gene.
C. Heterozygous gene.
D. Homozygous condition gene.

28. An insect flew from the anther of a flower with pollen grains attached on its body and stood on the stigma of another flower but on the same plant depositing pollen grains on it. What is the type of pollination carried out by the insect?
A. Insect pollination.
B. Self-pollination.
C. Cross pollination.
D. Animal pollination.

29. Which of the following the pairs is a characteristic of an efficient homeostatic system?
A. Large deviations from the norm and deviations rapidly restored back to the norm.
B. Small deviations from the norm and deviations slowly restored back to the norm.
C. Large deviations from the norm and deviations slowly restored back to the norm.
D. Small deviation from the norm and deviations rapidly restored back to the norm.

30. A individual of blood group A cannot receive blood donated by an individual of blood group B because his or her blood contains:
A. antibody b while the donor blood contains antigen B.
B. antigen A while the donor blood contains antibody a.
C. antigen A while the donor blood contains antigen B.
D. antibody b while the donor blood contains antibody a.

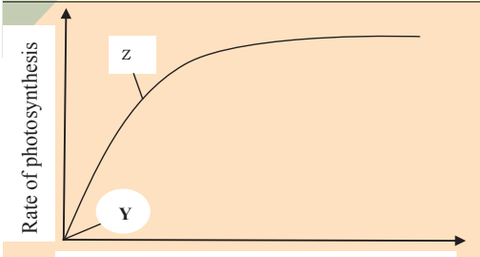
31. Which of the following does not apply during evolutionary process?
A. Genetical changes acquired are passed to the next generation.
B. Organisms exert selection pressure on the environment.
C. Changes in the environment select an organism either for or against them.
D. The less adapted organisms to the changes in the environment are selected against.

32. The table 2 below shows the relative number of stomata and relative transpiration rates for four different plant species.

Plant species	A	B	C	D
Relative number of stomata mm^{-2} of leaf (upper :lower leaf surface)	5:30	0:80	10:15	O:50
Relative transpiration rate (upper :lower leaf surface)	10:12	0:4	15:30	20:50

Which plant species carries out the highest rate of cuticular transpiration due to having the thinnest cuticle?
A. D
B. C
C. B
D. A

33. Figure 7 below shows the effect of increasing carbon dioxide concentration on the rate of photosynthesis.



Which of the following factors limit the rate of photosynthesis between points Y and Z?
A. Low light intensity.
B. Low carbon dioxide concentration.
C. Carbon dioxide concentration.
D. Low temperature.

34. Afforestation has often been recommended as a measure to slow down global warming and climate change. Which of the following explains the role of afforestation in global warming?
Afforestation;
A. Reduces carbon dioxide concentration in the atmosphere by increasing plant cover hence lowering rate of ozone depletion.
B. Increases carbon dioxide concentration in the atmosphere leading to formation of acidic rains.
C. Increases oxygen concentration in the atmosphere by increasing plant cover hence lowering ozone depletion.
D. Increases plant cover reducing effects of soil erosion and heat retention on the soil.

35. When two species compete in an ecosystem:
A. The species whose members are smaller in size get extinct.
B. Less fit organisms all die.
C. Resource partitioning occurs between the species overtime.
D. Population size of a species that needs little resources increases.

36. Which of the following conditions are advantageous for RuBP when functioning in C4 plants but not in C3 plants?
A. Low carbon dioxide and high oxygen concentrations.
B. Accumulated high carbon dioxide and high oxygen concentrations.
C. Low carbon dioxide and low oxygen concentrations.
D. Accumulated high carbon dioxide and low oxygen concentrations.

37. Which of the following factors are likely to affect the number and diversity of species reaching an area?
I. Geographical barriers.
II. Size and nature of the area.
III. Distance to be covered by organisms during dispersal.
IV. Reproductive potential of a species of organisms.
A. I, II and IV.
B. II, III and IV.
C. III, IV and I.
D. I, II and III.

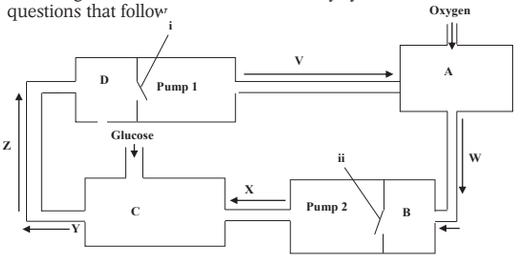
38. During which stages of cardiac cycle are the 'lub' and 'dub' heart sounds produced?
A. Atrial systole and ventricular diastole respectively.
B. Ventricular diastole and atrial diastole respectively.
C. Ventricular systole and ventricular diastole respectively.
D. Atrial diastole and atrial systole respectively.

39. Marine teleost's overcome the challenge of dehydration of their tissues due osmotic outflow of water by
A. Actively extruding salts using chloride secreting cells in the gills.
B. Eliminating nitrogenous waste in form of ammonia.
C. Not ingesting sea water and having high ultrafiltration rate in the kidney.
D. Retaining urea in the body to maintain body fluids osmotic pressure above that of the sea.

40. Which of the following is the role of gastrin hormone in control of digestion?
A. Stimulates pancreas to increase secretion of pancreatic juice.
B. Stimulates contraction of gall bladder to release bile.
C. Inhibits emptying of the stomach into the duodenum.
D. Stimulates gastric gland to secrete gastric juice rich in hydrochloric acid.

SECTION B

41. A student constructed a model to represent blood circulation in human as shown below. Study and compare it with your knowledge of the actual human circulatory system to answer the questions that follow



a) Name the actual structures that correspond to the following model parts:
A, B, C, D, Pump 1 and Pump 2.

b) The directions V, X, Y and W represent the directions of blood flow. Suggest two differences between blood contents in vessels X and Y in a real circulatory system.

c) Suggest the natural sources from which oxygen and the glucose would be derived in real life situation.
d) i) Identify four errors in assembling the model.

ii) Show how the model errors in (d) (i) above would lead to undesirable conditions if they were to occur in human.

42. A student was given a punishment of lifting a bench above his shoulder for unlimited time duration. When he persevered for over 10 minutes the class saw the bench lowering and falling against the student's efforts to maintain its level up.

a) Name the muscle properties that:
i) maintained the bench above the student's shoulder.
ii) made the bench to lower.

BIOLOGY PAPER 1 (ABIO 003)

b) Suggest the physiological explanation for the lowering and the bench falling off.

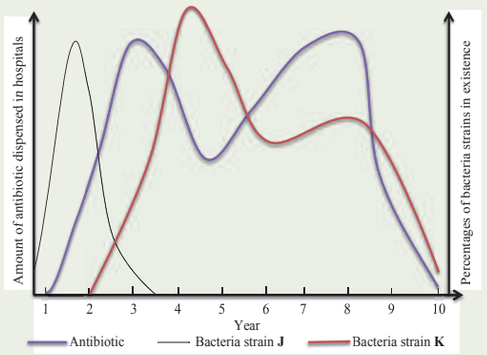
43. a) Give precise meanings of the following terms:
i) Behaviour

ii) Migration

iii) Territoriality

b) Suggest five ways in which migration and territoriality benefit the animals that practise such behaviours?

44. The following graph shows application of some antibiotic on two strains of bacteria J and K in one of the countries in Africa. The data only demonstrate the averages from five hospitals over a period of nine years of application of the antibiotic. All the bacteria were established to be having haploid numbers of chromosomes.



a) i) What biological process is being demonstrated by this data?
ii) Identify two effects of application of the antibiotics on the bacteria strains.
iii) Explain the effects identified in (a) (ii) above.

b) To what extent did haploid numbers of chromosomes contribute to the information provided compared to if the bacteria were diploid?

c) Predict and state the effects of the hospital policies towards application of the antibiotic from:
i) year 2 to year 3.
ii) year 3 to year 8.

d) What measure was most effective in controlling bacteria strain K?

45. Fish uses fins to propel it forward as well as maintaining its stability. Using illustration, show on a single fish how the following maybe brought about:
a) Force required to propel fish forward.

b) Instability by pitching.

c) Control of pitching

46. a) What is photorespiration?

b) How do high levels of respiratory gases affect photorespiration and photosynthesis?

c) Explain how high carbon dioxide is not as important to C4 plants as it is to C3 plants in influencing the rate of photosynthesis.

ANSWERS TO GENERAL PAPER (AGP002)

SECTION A

Question 1
1.Domestic violence is any form of behaviour whose purpose is to gain power and control over a spouse or partner. It ranges from sexual and psychological to physical abusive acts, including negligence, spouse-battering and child abuse.

Causes of domestic violence
- Poverty as it makes people irritable and stressed. It also leads to lack of basic needs like medical care, food and others, hence resulting in misunderstandings
- Addiction to drugs, such as narcotics as they may cause the drug user to lose their sense of understanding and transfer anger to members of their family
- Breakdown in communication as this may lead to individuals being ignorant of another's likes and dislikes, which causes misunderstandings
- Cultural differences in terms of language, food, marriage requirements and other aspects may result in disagreement
- Misinterpretation and ignorance of men's, women's and children's rights
- Income inequality and change in social status
- Barrenness and impotence
- Extended family conflicts
- Polygamy and its associated evils
- Peer pressure and influence from either parents or children.
- Lack of mutual trust in a partner in terms of finance, faithfulness, etc.
- Physical or mental illnesses, such as post traumatic stress disorder, may result in violence.
- Violent personality of a partner.
- Laxity on policy enforcement against physical, sexual and psychological torture of partners.

Solutions to domestic violence
- Counselling by relatives, elders, in-laws to settle disputes among family members.
- Make penalties for domestic violence consistent and firm.
- Encourage prevention programmes for example teach young people the dangers of being abusers.
- Increase funding for sectors dealing with family violence prevention.
- Help women to be economically independent as many have been seen to stay in abusive relationships for fear of being homeless due to inability to sustain themselves and their children.
- Religious leaders should strengthen good morals in homes.
- Discourage infidelity in relationships.
- Partners should embrace communication in relationships.
- Make research and give a clear picture of statistics for the cases so that the problem can be dealt with easily.

Question 2
Parental negligence refers to a deliberate practice or decision that involves neglect by the parent or guardian in the provision of basic needs for the welfare of their children. Juvenile delinquency, on the other hand, is a form of misbehaviour among young people below the age of 18. It includes theft, fighting, use of vulgar language and fornication.

Parental negligence as a cause
- Parents have become too busy to have enough time for their children's upbringing and welfare.
- Some parents do not give proper guidance or caution to their children.
- Poor parents do not support their children with basic upkeep needs for personal administration.
- Some parents are violent and abusive to the children, thereby making them uncomfortable to stay in the homes.
- General breakdown in effective communication between parents and their children, given the fact that some parents are harsh or hostile to their children

Other factors
- Negative peer pressure/influence among the young people
- Influence of drug abuse and addiction
- Breakdown in the traditional African family value system
- Negative influence of the media through persuasive and nude models.
- Permissiveness accorded to children today
- Increased stress and frustration among young people.
- Weak laws regarding juvenile offenders

Question 3
Food insecurity refers to a situation where there is insufficient food supply at a household level or in a country for a period of time.

Ways
- Support farmers with fast-yielding crop varieties.
- Improve the storage facilities to ensure food is not eaten up immediately after harvest.
- Institute deliberate policies to control population and minimise consumption.
- Educate the population on the value of having adequate food at household level.
- Use improved/modern farming methods to ensure high quality production.
- Diversify food varieties for example cereals, tubers and grains.
- Enforce strict laws to guard against reckless handling of food within the household and the nation at large.
- Support existing organisations that work towards ensuring sufficient food supply.
- Revive co-operative societies that emphasise the need to have enough food at every household.
- Provide more funds to organisations, such as the National Agricultural Advisory Services (NAADS) and National Agricultural Research Organisation (NARO) so that they can increase capacity for value addition.

Question 4
The teaching of science subjects is a deliberate policy that aims at promoting science-related disciplines in areas of education, innovation and research among learners. The main science subjects include physics, biology, chemistry, mathematics and agriculture.

Positive
- Increased training of teachers in the science-related subjects.
- Attracted the attention of foreign funding for improved science education.
- More construction of school infrastructure and facilities; e.g., laboratories.
- Increased research in the performance of science-based disciplines.
- Encouraged more learners to take on more science subjects

Negative
- It has constrained the government in terms of teachers since those trained in these disciplines are few.
- Created a serious divide-and-rule situation among teachers of sciences and those of arts subjects.
- Encouraged lazy and weak learners to take on science combinations at A'level .
- It has constrained school authorities and administrators in terms of effective planning, given the inadequate materials to support science subjects.
- Many government-aided institutions lack qualified personnel for example teachers and laboratory attendants, which compromises the quality of science teaching.

Spelling =05 marks
General expression =10 marks
Definition =05 marks
Content (causes and solutions)= (any 10 points x 03marks each =30 marks)
TOTAL =50 marks

NOTE: Every essay must have a conclusion for Section A.

Turn to next page

THE TEACHERS

MOYA MARTIN GEORGE ZAPWE,
KING'S COLLEGE, BUDO

NAKANWAGI JACKIE,
OUR LADY OF GOOD COUNSEL SSS, GAYAZA

ANSWERS TO GENERAL PAPER

Activities.
a).1. Fishing activities F
2. Accommodation A
3.Food kiosks K
4. Petty trade P
5. Small-scale farming S

Rating of activities

Activity	No activity	Best activity
F	0	5
A	0	5
K	0	5
P	0	5
S	0	5

Activity rating

Names	F	A	K	P	S	Total
Kyasanku	5	0	0	2	1	8
Owilla	0	4	3	2	0	9
Tushabe	0	0	0	2	0	2
Michombero	5	0	0	2	0	7
Mukisa	0	0	0	2	0	2

b) When reversed, all retain their weight totals except Michombero who changes from 7 to 3.

Names	F	A	K	P	S	Total
Kyasanku	1*	0	0	2	5*	8
Owilla	0	4	3	2	0	9
Tushabe	0	0	0	2	0	2
Michombero	5*	0	0	2	0	3*
Mukisa	0	0	0	2	0	2

*** represents =change**

c) Challenges caused by rising flood waters
- Loss of lives.
- Vast property damage.
- High costs of repairing and replacing flood-damaged roads, bridges, public roads, etc.
- Diseases due to contaminated water which carries raw sewage, leaked toxic chemicals and runoff hazardous waste that may pollute the water and cause infections.
- Destruction of crops and livestock.
- Contributes to mental health problems (trauma) due to the losses.
- Economic loss in form of destroyed businesses or wages.
- Downturns in regional tourism due to fear of accidents.

d) Measures taken to mitigate the challenges
- Planting vegetation to retain extra water.
- Terracing hillsides to slow flow of water down hill.
- Constructing flood ways/man-made channels to divert flood water.
- Modifying homes and businesses to help them withstand floods.
- Restoring rivers to their natural courses.
- Investing in flood insurance policies.

6. a) - How traders contaminate food in a bid to preserve it.
- Harmful food preservation.
- Preservation means that contaminate food.

b) - Formalin leads to irritation to the stomach over time, causing vomiting, dysentery or death.
- Chronic poisoning due to eating foods that are preserved with formalin damages kidneys and also causes cancer.

c) - Use of Formalin and inorganic salts which poses a health hazard to consumers.
- Dreaded Formalin drugs are used to both make meat appear fresh and to keep flies away.
- Sodium metabisulphite which is easily available at several chemists down town is mixed with water and sprayed on meat to maintain its reddish hue and create the impression that it is fresh.
- Fish is also immersed in a basin with a mixture of sodium metabisulphite and water to keep it fresh.

d) (i) to make a bad situation worse
(ii) to stop/make illegal the consumption of an item
(iii) like a disinfectant/act as a chemical compound used to protect food against decay
(iv) an element that is harmful or causes danger to life
(v) unfit/undeclared additives to retard spoilage in food
(vi) to put across criticism/allegation on pains caused as a result of consuming food
(vii) take strong action to stop a particular activity
(viii) not experiencing any discomfort regarding a situation/ untouched
(ix) action directed at stopping a particular bad practice
(x) Appearance of meat contaminated with Formalin (rough/ stiffened outer layer of meat)

GENERAL PAPER QUESTIONS (AGP003)

SECTION A

1. Account for the increased cases of defilement in your country and suggest possible solutions to the problem.
2. Examine the challenges facing the judiciary system in your country.
3. "The increase in gender-based violence in Uganda is largely a result of poverty." Discuss.
4. Justify the need for environmental conservation in your country.

SECTION B

5. The COVID-19 pandemic that started in the town of Wuhan in China has swept all over the world, with very few countries remaining unaffected. In Uganda, it led to the closing down of schools on 20th March, 2020. Many of the students have been receiving their study materials in the newspapers and also over the Internet for those that have access. Seven friends from different top schools in the nation have decided to have a debate aired on TV on the motion that "Teachers are more important than doctors."

They are Peter, Allen, Mariam, Tendo, Shafik, Vincent and Wilber. All the social distancing rules were to be followed and the arrangement was as follows:
- All the participants sat in a straight line at the table.
- The speakers were to present alternating from each side.
- The chairperson took the middle seat
- The proposers and opposers took opposite sides from the chairperson
- The first speaker was seated next to the chairperson.

The following prevailed during the debate:
- Mariam was the first speaker. She stated that the teachers would train more doctors if many died during the pandemic. She was followed by Tendo.
- Mariam and Wilber had conflicting ideas.
- Tendo was seated further from Mariam than Wilber.
- Vincent was seated to the right hand side of Mariam
- Wilber was seated between Tendo and Peter
- Shafik was seated furthest from Wilber

Questions

(a) Show the seating arrangement at the table

(b) i) Who was the chairperson of the debate?
ii) Who were the opposers of the motion?

c) On which side was:
i) the 3rd speaker in the debate?
ii) the last speaker in the debate?

d) Do you think Vincent and Wilber were on the same side? Give a reason for your answer.

e) Examine the impacts of the COVID-19 pandemic on the economy of Uganda.

6. **Read the passage below and answer the questions that follow.**

While the influence of population growth on economic development is a subject of heated debate, the weight of scholarly opinion today supports the view that the poorest countries would be more likely to achieve reasonable percapita income growth if their birth rates declined. The connection between economic and population growth is often confused by a chicken-and–egg dilemma.

Economic growth often leads in declines in death rates and increase in immigration, both of which contribute to population growth and are mutually reinforcing. When the discussion is narrowed to the relationship between birth rates and percapita income change, the negative influence of high fertility on income is more apparent. When each generation is similar in size to the one that precedes it, parents find it easier to prepare their children for productive lives.

Governments find it easier to build and maintain transportation infrastructure and provide such social services as universal schooling. These lay the ground work for investment, innovation and economic growth.

It is possible, of course, that rapid population growth may contribute to economic growth at certain times and yet constrain it at others. In societies, fortunate enough to begin the development process with small populations and abundant natural resources, rapid population growth may indeed help spur economic development. But in most developing countries today, populations are already large relative to the availability of natural resources and supplies of renewable fresh water and farmland are scarce and often concentrated in a few hands. Under such circumstances, further rapid population growth is especially likely to contribute to soil erosion, decline in water quality and quantity, and the partitioning of farmland into parcels too small to support families. These trends can undermined both subsistence farming and cash crop production and hinder both economic growth and industrial development, which historically have been built up as strong agricultural economies.

Governments must grapple with all the problems of resource scarcity and inequality, while also devoting disproportionate effort to the challenge of educating and providing jobs for the ever growing generations of young people. Lending support to the changing relationship between population and economic growth, a recent review of the evidence suggests that the association between high birth rates and slowed income growth was weak in the 1960s and 1970s but strengthened significantly in the 1980s, especially in the poorest countries.

In theory, more people mean a country can produce and consume more goods and services, leading to economic growth. But this can only occur when employment opportunities grow at least as fast as the labour force and when people have access to the necessary education and training. This is a race that many governments are losing. Rapid population growth complicates the task of providing and maintaining the infrastructure, education and healthcare needed by modern economies.

"The balance of present scholarly judgment", writes population scientist Joel E Cohen, is that slower population growth would benefit most developing countries and that rapid population growth exacerbates many other problems which is not the sole or principal cause.

Trade is now a global activity and future economic growth in industrialised nations will depend in large part on the capacity of people in countries around the world to pay for imported products. Boosting U.S exports, for example, stimulates the growth of jobs that pay, on average, wages that are 13% above average. Moreover, the most dynamic growth in demand for these imported goods is occurring in developing countries. Rapid population growth can erode the expansion of this demand.

Questions

a). Suggest an appropriate title for the passage.
b). What does the author mean by the following phrases:
i. "prepare their children for productive lives"
ii. "the most dynamic growth in demand"
c). In not more than 100 words, summarise how population growth affects economic development.
d). Explain the meaning of the following words and phrases as used in the passage.
i. weight of scholarly opinion
ii. chicken-and-egg dilemma
iii. mutually reinforcing
iv. narrowed to
v. spur
vi. grapple with
vii. a race
viii. scholarly judgment
ix. exacerbates
x. erode the expansion

Find answers only in New Vision next Friday

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