535 PHYSICS PAPER 2 MARKING GUIDE-NEREB 2022

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| **No** | **SCORING POINTS** | **REMARKS** | **Mks** |
| 1(a)(i)  (b)(i)  (ii)  (c)(i)  (ii)  (d)(i)  (ii) | Density is the mass per unit volume.  S.I Unit = kgm–3   * The ball will first **accelerate** and its **velocity increases**. * The acceleration slowly decreases until it is zero. * The ball then moves with a constant (terminal) velocity.   F =  F =  F = 146.7N  When a body is partially or totally immersed in a flluid, it experiences an upthrust equal to the weight of the displaced fluid.   * A solid is weighed in air using a spring balance and its weight, Ws recorded. * A displacement can is filled with water when a beaker is placed under the spout. * When water has stopped dripping from the spout, a beaker is weighed and its weight Wb noted and the beaker placed under the spout. * While still suspended on the spring balance, the solid is immersed partly in the water in the displacement can and the apparent weight, Wapp noted. * It is then completely immersed in water and the new apparent weight noted. * It is found that up-thrust is equal to Ws – Wapp which verifies Archimedes’ principle.   A floting solid displaces its own weight of the fluid in which it foats.  Most of the volume of a ship is empty space filled with air.   * This makes the effective density of the ship less than that of water. * This enables the ship to float on water in spite of being made of metal. | First three | 2  3  3  1    3  1  3  **16** |
| **No** | **SCORING POINTS** | **REMARKS** | **Mks** |
| 2(a)  (b)  (c)  (d)(i)  (ii) | * The ratio of sine of angle of incidence of angle of refraction is a constant for a given pair of medium. * At the point of incidence, the incident ray, the normal and the refracted ray lie in the same plain. * Optical centre is the centre of the lens. * Principal focus is a point on the principal axis where all rays originally parallel and close to the principal axis converge to after passing through the lens.   F  F  Nature: Real, inverted, magnified **(Do not mark if no diagram)**  Image is at 60cm  Magnification m = = = 2   * Critical angle is the angle of incident in an optically denser medium which gives the angle of refraction as 90o. * Total internal reflection is the reflection that occurs inside an optically denser medium when the angle of incident is greater than critical angle.   Angle of incident = 90 – 20 = 70o  Angle of refraction = 131 – 90 = 41o  From n = =  = 1.43  From sin c =  =  = 0.698  c = 44.3o | * Any two correctly drawn rays. * Good vertical and horizontal scales * Mark nature if diagram is correct | 2  2  5  2  5  **16** |
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| 3(a)(i)  (ii)  (b)(i)  (ii)  (c)  (d)(i)  (ii) | Echo is reflected sound.   * Inside a discotheque, loud soud is always produce which woud cause noise pollution. * The walls of the discotheque is therefore covered with soft, spongy materials that absorb sound preventing them from being transmitted outside. * This enables it to avoid noise pollution.   Resonance occur when a body is forced to vibrate at its natural frequency by a nearby body vibrating at the same frequency.   * A resonance tube is filled with water. * A vibrating tuning fork of known frequency, f, is placed near the open end and the tap opened. * The tap is closed when a loud sound is heard. The length, l1 of the air column is measured. * The experiment is repeated by opening the tap and the tap is again closed when a loud sound is heard and the new length, l2 is measured. * The speed of sound, v, is the obtained from the expression   v = 2f(l2 – l1) .  Distance to 1st cliff 2s = 320 x 1.5  s =  =240m Distance to 2nd cliff 2s = 320 x 2  s =  =320m  Distance between the cliffs s = 240 + 320 =560m  Diffraction is the bending of waves when the pass at the edge of an obstacle or they pass through a gap in the obstacle in their path.   * At night, air near the ground is cold and therefore more dens than air up. * When sound is produced, it is refracted downwards. * It is therefore well received at a distance. | …and the tube raised  …stop raising the tube when…  … by raising the tube further.  2s = 320(1.5 + 2)  2s = 1120  S = 560m | 1  3  1    5  3  1  3  **16** |
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| 4(a)(i)  (ii)  (b)(i)  (c)  (d)(i)  (ii) | For a fixed mass of gas at constant volume, the pressure is directly proportional to the absolute temperature.   * A round bottomed flask tightly with a fitted tightly rubber bung is connected to a bourdon gauge using a rubber tube. * The flask is placed in a water bath containing cold water. * The temperature of the water bath is measured and the corresponding pressure is also read. * The water bath is heated for a short time interval and the bath is stirred. The new temperature and corresponding pressure are measured several times. * If a graph of pressure against temperature is plotted, a straight line graph cutting the temperature axis at –273oC is obtained. * The graph shows that pressure is directly proportional to the absolute temperature.   V1 = 1000cm3  T1 = 200oC = 200 + 273 =473K  V2 = ?.  T2 = 200oC = 10 + 273 =283K  From  =  =, V2 = 598.3cm3  Specific heat capacity is the quantity of heat needed to raise the temperature of 1kg mass of a substance by 1K  Heat loss = Heat gained  mbccθ1 = mcccθ2 + mwcwθ2  x 400 x (145 – θ)=  x 400 x (θ - 25) +  x 4200 x (θ - 25)  11600 - 80θ = (100θ – 2500) + (1260θ – 31500)  T(oC)  *t*(s)  0  25  1440 θ = 45600  θ = 31.67oC | 0  0  P(Pa)  T(oC)  -273oC  . | 1  6  3  1  4  1  **16** |
| **No** | **SCORING POINTS** | **REMARKS** | **Mks** |
| 5(a)  (b)(i)  (ii)  (iii)  (c)  (d)(i)  (ii) | 1 joule is the energy when a force of 1N moves its point of application through a distance of 1m in the direction of the force.  Energy cannot be created nor destroyed but can be converted from one form to another.  Renewable sources of energy includes:  Running water in rivers, wind, the sun, waves, geothermal  Any correct use of the source mentioned.   * A dam is built to hold and reserve water where there is a water fall. * The dam is built with tunnels in which there are turbines connected to dynamos. * When water flows through the tunnel, the turbine is rotated which in turn turns the dynamos. * The dynamos produce electricity. * When the boy jump down, he will reach down with a momentum. * On his feet touching down, his momentum reduces. * To reduce his momentum with little force, the time for action of the force is lengthen by flexing the knees.   Momentum after = Momentum before  (0.5 x 13.6) + (0.3x v) = (0.5 x 40) – (0.3 x 20)  6.8 + 03v = 20 – 6.8  0.3v = 7.2 v = 24ms-1  k.e before collision = m1u12 + m2u22  =  x 0.5 x 402 + x 0.3 x 202= 460J  k.e after collision = m1v12 + m2v22  =  x 0.5 x 13.62 + 0.3 x 242  = 132.64J  Loss in k.e. = 460 – 132.64 = 327.36J | The total energy is constant. | 1  1  2  2  3  3  3  **16** |
| **No** | **SCORING POINTS** | **REMARKS** | **Mks** |
| 6(a)  (b)(i)  (ii)  (c)  (d)(i)  (ii)  (iii) | E.m.f is the total work done or energy expended in driving one coulomb of charge in a complete circuit that the cell is connected.  A  Zinc electrode  Copper electrode  Dilute sulphuric acid  Hydrogen gas bubbles  Direction of electron flow  Direction of current flow  Zinc electrode slowly desolve to form Zinc ions and release two electrons which transported via the external circuit to the copper electrode.  At the copper electrode, Zinc and Hydrogen ions are attracted where Hydrogen ions are discharged in preference forming Hydrogen gas bubbles. The gas is oxidised to water by potassium dichromate depolariser.  Polarisation: This is minimised by adding potassium dichromate as a depolariser which oxidise hydrogen to water.  Local action: This mimimised by cleaning the zinc surface with sulphuric acid and rubbing mercury which forms an amalgam free from impurities.  At constant tempeerature, the p.d across a conductor is directly prorportional to the current flowing through it.  Total electromotive force = 4 x 1.5 = 6V  Total internal resistance = 0.5 x 4 = 2Ω  For resistors in patallel R =  =  = 2Ω  Total resistance in circuit = 2 + 2 + 2 = 6Ω  Using I =  =  = 1A  Using V = IR =1 x 2 = 2V  P.d in parallel circuit = 2 x 1 = 2V  Using I =  =  = 0.33A  P = VI = 2 x 0.33 = **0.67W** | E.m.f is the p.d across a cell in an open circuit.  Any two **parts of the cell** of correctly drawn cell**.**  Accept potassium permanganate  **Mark manganese (iv) oxide wrong.**  R = 2+2 = 4 Ω  E = I(R + r)  6 = I(4+2)  6 = 6I  I = 1A | 1  4  4  1  3  2  1  **16** |
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| 7(a) | * The strength of the magnet. * The length of the conductor. * The magnitude of the current flowing.   N  S  N  Cone  Tubular magnet  Soft iron core  Soft iron core  Voice coil   * An alternating current caused by an audio frequency source is made to flow in the voice coil creating force on the coil. * This forces the voice to move backward or outwards causing the cone to produce a rarefaction and compression respectively in air around. * This reproduces the original sound louder.   Powere loss in transformers can be minimised by   * Using **soft magnetic materal** as core so as to ave **complete reversal** of magnetic flux when curent changes direction. * Using wires of **low resistance** in windings so that energy is not discipated as heat. * Having the core laminated to rduce eddy current. * Having the core deign in shuch a way that all the flux generated at the primay coil link with the seconday coil.   Power wasted in the windings is gven by  P = I2R  P = 102 x 4 = 400W  Power input  P = IV  P = 10 x 200 = 2000W  η =  η =  = 80% | First two  Any four correctly labelled parts on a workable diagram.  First three | 2  2  3  3  2  4  **16** |
| **No** | **SCORING POINTS** | **REMARKS** | **Mks** |
| 8(a)(i)  (ii)  (b)  (c)(i) | Cathode rays are a stream of fast moving electrons.   * Both travel in a straight line. * Bothe ionise gases * Both affect photographic filim * The cathode rays are made to pass through an electric field. * The cathode rays are deflected towards the positive plate showing that they are negatively charged.   Radoisotopes are atoms of an element that undrego spontaneous disintegration with the emmision of alpha, beata and gamma radiations.   * Thicness gauge * Radiotherapy * Radioactive dating * Steralisation of food and medical equipment   256 128 64 32 16 8 4 2  7 half-lives  Time taken = 7 x 4 = 28minutes.  Nuclear fission is the splitting of a heavy nucleus of an atom into two smaller ones with the release of energy.   * Uranium nucleus is split into daughter nuclei releasing heat energy. * The heat energy is used to heat up water to produce steam at high pressure. * The steam is used to drive turbines. * The turbines drive dynamos producing electricity. | First two  First two  2T/t½ =  2T/4 =  = 128 = 27  = 7 ⇒ T = 28minutes | 1  2  2  1  2  3  1  4  **16** |