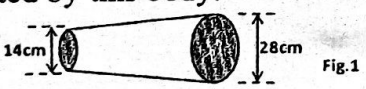
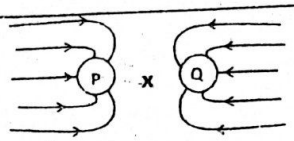
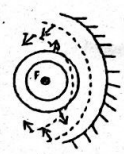
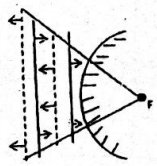
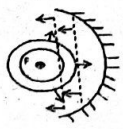
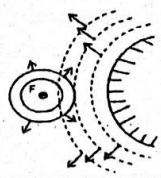
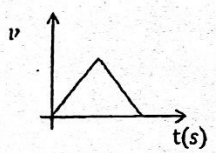
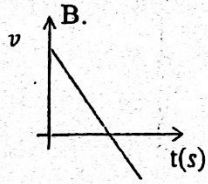
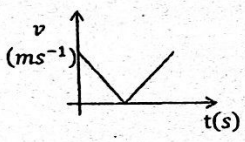
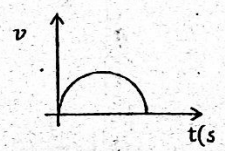
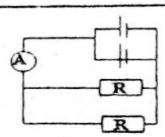
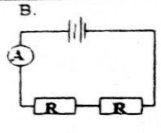
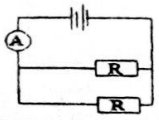
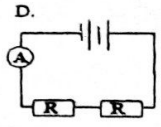
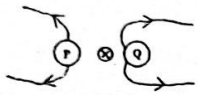
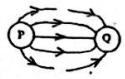
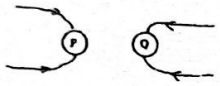
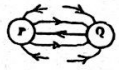
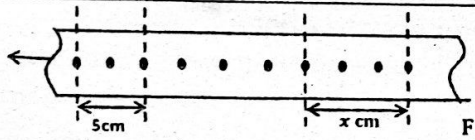
	WAKISSHA 2020 PHYSICS 535/PAPER 1 MARKING GUIDE		
1.	Threads within tyres are used to A. make tyres attractive B. make tyres stronger C. reduce friction D. help tyres grip the road surface.	Threads make tyres stronger while treads help tyres grip the road surface	B
2	A larger amplitude produces a sound wave which is: A. louder B. less loud C. high and sharp D. flat	Amplitude is a factor for loudness while frequency is a factor for sound being high and sharp	A
3	The device used in half-wave rectification is A. dynamo B. semi-conductor diode C. C.R.O D. Voltmeter	Dynamos are for producing voltage and current while Diodes are for rectification.	B
4	The optical device used to form a real and inverted image on the screen placed on the same side as the object is A. concave mirror B. convex mirror C. concave lens D. convex lens	Mirrors produce images (by reflection) while lenses produce images by (refraction). Also all convex mirrors/concave lenses produce virtual, diminished and upright images regardless of the image position.	A
5	The correct order of the processes undergone by a volatile liquid in a domestic refrigerator is (i) evaporation (ii) cooling (iii) compression (iv) condensation A. (ii), (i), (iii) and (iv) B. (iii) (ii), (i), and (iv) C. (i), (ii), (iv) and (iii) D. (i), (ii), (iii) and (iv)	Refrigeration systems include: expansion or evaporation leading to→cooling→compression leading to →condensation.	D
6	**Figure 1** below represents a horizontal solid frustrum of mass 1.54kg with respective diameters of 14cm and 28cm. Calculate the maximum pressure that can be exerted by this body.  Fig.1 A. $2.5 \times 10^3 Nm^{-2}$ B. $1.1 \times 10^3 Nm^{-2}$ C. $5.5 \times 10^3 Nm^{-2}$ D. $1.0 \times 10^3 Nm^{-2}$	Maximum pressure $= \frac{\text{Force or Weight}}{\text{Minimum area}}$. Maximum pressure $= \frac{1.54X10}{\pi x\ 0.07^2}$ Max pressure $= \frac{15.4}{0.0154} = 1{,}000$ Pa	D
7.	In a simple cell, the source of electrons which constitute the electric current is A. the zinc plate B. the copper plate C. dilute sulphiric acid D. Potassium dichromate	Electrons from a simple cell originate from the zinc (negative) plate. While conventional current originates from the copper plate.	A

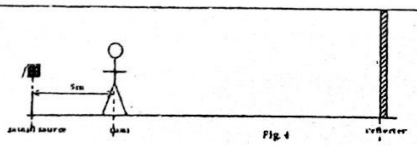
8.	 Fig. 2 Figure 2 above represents the electric field pattern of charged bodies P and Q. When P is brought near the cap of a positively charged electroscope, the leaf will A. diverge B. be unaffected C. collapse D.converge and later diverge	In ward magnetic field represents negative charges. Since the gold leaf electroscope is positively charged then the leaf will **collapse** because opposite charges attract (cause collapsing) each other while same charges repel (cause divergence of gold leaf)	**C**
9.	Which of the following devices uses a soft magnet? A. Motor B. Electric bell C. AC generator D. Thermionic Diode	An electric bell uses a soft iron since the required magnetism for the armature to hit the gong is temporary. On the other hand motors and generators use permanent magnets.	**B**
10.	A man pushes a body with a force of 150N at an angle of 30^o to the horizontal. Find the horizontal force which acts on the body. A. 23.1N B. 75.0N C. 86.6N D. 129.9N	$\cos 30^o = \frac{\text{adjacent}}{150N}$ $\cos 30^o = \frac{150N}{x}$ $x = 150\cos 30^o = 129.9N$	**D**
11.	<table><tr><th>Element</th><th>Neutrons</th><th>Protons</th><th>Electrons</th></tr><tr><td>P</td><td>6</td><td>6</td><td>6</td></tr><tr><td>Q</td><td>2</td><td>2</td><td>2</td></tr><tr><td>R</td><td>8</td><td>6</td><td>6</td></tr><tr><td>S</td><td>2</td><td>3</td><td>3</td></tr></table> The table above shows the structure of four atoms P, Q , R and S. Which ones of them are isotopes of the same element? A. P and R B. Q and R C. P and S D. P and Q	Isotopes of the same element should have same number of protons/electrons (atomic number) and different number of neutrons (or different mass number).	**A**
12.	Which of the following diagrams shows correct reflection of an incident circular wave from point F? A.  B.  C.  D. 	Circular waves are reflected as straight waves from concave reflectors.	**C**

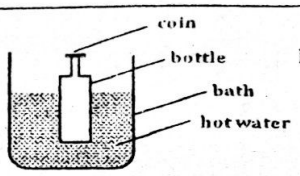
13.	A body at the equator experiences a smaller gravitational attraction than a body at one of the poles of the Earth. This is because A. the earth is a perfect sphere B. the equatorial radius of the earth is greater than the polar radius. C. A body at the equator experiences a greater centripetal force. D. the polar radius of the earth is greater than the equatorial radius.	Bodies at equator are the far from the centre of the earth than any other place on the earth hence experience less gravitational force. On the other hand bodies at the poles experience bigger gravitational force because they are nearer to the earth's centre than those at the equator.	**B**
14.	An object is placed at 15cm in front of a concave lens of focal length 15cm. What is the nature of the image produced? A. Inverted B. Magnified C. Same Size as object D. Diminished	All images before a concave lenses are always upright or erect and **diminished** unlike those for convex lenses which depend on the position of the object along the principal axis.	**D**
15.	The respective lower and upper fixed points of a calibrated thermometer are 2cm and 52cm respectively. An unknown temperature of a suspected **Covid-19** patient is found at 30cm below the upper fixed point. What is the temperature of the suspect to prompt **social distancing**? A. $\frac{20}{50} \times 100^0C$ B. $\frac{30}{50} \times 100^0C$ C. $\frac{28}{52} \times 100^0C$ D. $\frac{32}{52} \times 100^0C$	temperature$= \frac{x}{y} \times 100^0C$ $= \frac{(22-2)}{(52-2)} \times 100^0C = 40^0C$	**A**
16.	Which of the following velocity-time graphs represents the motion of an Olympic high jumper? A.  B.  C.  D. 	When the high jumper moves upwards, he moves with decreasing velocity. Then while at the top he moves with increasing velocity in the opposite direction to a maximum.	**B**
17.	The following circuit arrangements represent batteries connected to resistors. In which arrangement does the ammeter show greatest deflection?	Series battery arrangement increases voltage and current. Likewise parallel arrangement of resistors reduces resistance and also increases current.	**C**

	A.  B.  C.  D. 		
18.	Two insulated metal spheres P and Q are placed in contact. A negatively charged rod is brought close to Q. While the negative rod is still in its position, an earth wire is connected to P and later broken. Finally the rod is removed and the spheres separated. Which of the following field patterns is correct for P and Q after the experiment? A.  B.  C.  D. 	When the negative rod is brought close to Q, Q develops positive charge while P negative charge. When an earth wire is connected to P electrons flow from P to the earth. After breaking the earth wire and then later removing the negative rod leaves both P and Q with positive charge with outward electric field lines.	**A**
19.	Four bars of metal P, Q, R and S are tested for magnetism. Q attracts both P and R but not S. S is not attracted to P, Q or R. Which of the following statements is correct about P, Q, R and S? A. P, Q and R are magnets while S is magnetic. B. P and Q are magnets while R and S are magnetic. C. P, R and S are magnets, while Q is magnetic. D. Q is a magnet, P and R are magnetic while S is non-magnetic.	Since Q attracts both P and R, it means that it is a magnet while P & R are either magnets or magnetic. Since S is not attracted to P, Q and R then it is not magnetic.	**D**
20.	 5cm x cm Fig. 3 **Figure 3** above shows a belt attached to a trolley moving in the direction shown. If the frequency of the timer is 50Hz and the trolley accelerates at the rate of 5.8 ms^{-2}. Calculate the value of x.	Initial velocity $= f\lambda$ $= 50 \times \left(\frac{5}{100}\right) \div 2 = 1.25 ms^{-1}$ Final velocity $= f\lambda$ $= 50 \times \frac{x}{100} \div 3 = \left(\frac{1}{6}x\right) ms^{-1}$ Total acceleration time $= \frac{1}{f} \times$ no of gaps. $= \frac{1}{50} \times 6.5 gaps = 0.13 seconds.$	**D**

	A. 7.05cm B. 7.54cm C. 10.5cm D. 12.02cm	Now: acceleration $= \frac{v-u}{t}$ $5.8 = \frac{\frac{1}{6}x - 1.25}{0.13}$ $x = 12.02\text{cm}$	
21.	A piece of cloth is viewed through a blue glass and it appears blue. Which one of the following mixtures produces the correct colour of the cloth? A. Red + Green B. Green + Blue C. Red + Blue D. Red + Green+Blue	Blue under white colour of light looks blue. Likewise blue under blue bulb also looks blue. Now white is produced by mixing all the three primary colours (ie blue, green and red)	**D**
22.	The distance between **eight** crests of a water wave is 350cm. If the velocity of the wave is 20ms^{-1}, calculate its frequency. A. 20Hz B. 40Hz C. 50Hz D. 100Hz	Velocity $= f\lambda$ $20 = f \times \left(\frac{350}{7}\right) \div 100$ $f = 40\text{Hz}$	**B**
23.	A Strontium – 90 nucleus undergoes a certain decay to produce a daughter nuclei Yttium – 90 and a radiation X, according to the equation below: $^{90}_{38}\text{Sr} \rightarrow {}^{90}_{39}\text{Y} + {}^{A}_{Z}\text{X}$ The emitted radiation X is A. Alpha B. Beta C. Gamma D. Proton	$90 = 90 + A$ $A = 0$ $38 = 39 + Z$ $Z = -1$ Therefore; the radiation is $^{0}_{-1}\text{X}$ which is a Beta particle	**B**
24.	An object is placed in front of a convex lens at a distance of 1.5 of its focal length. What is the nature image formed? A. Real, inverted and magnified B. Real, erect and diminished, C. virtual, inverted and diminished D. Real, inverted and magnified	When the object is at a distance of: (i)$u \leq f$, the image is virtual, upright and magnified. (ii)$u = f$, the image is at infinity. (iii)$u \geq f \leq 2f$ or 1.5f, the image is real, inverted and magnified. (iv)$u = 2f$, the image is real, inverted and same size. (iv)$u \geq 2f$, the image is real, inverted and diminished.	**A**
25.	Two thermometric liquids P and Q are heated up to their respective boiling points. P has a low boiling point. Which of the following properties is correct about P or Q? A. P wets glass B. P is opaque C. Q wets glass D. Q does not expand regularly	Low boiling point is alcohol not mercury. Therefore all the behaviors of alcohol are correct.	**A**
26.	A 50kg mass body and a 20kg mass body are projected into space to cover the same vertical distance over the roof of a house with the	For projectiles, time does not depend on mass: $t = \frac{v-u}{\text{gravity}}$	**C**

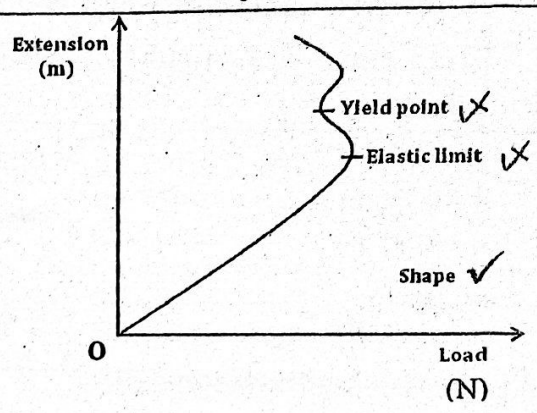
	same initial upward velocity. Ignoring air resistance, which of the following is correct about the two bodies? A. The 20kg mass returns to the ground faster B. The 50kg mass returns to the ground faster C. They both return to the ground at the same time. D. They both remain in space.	Also in $S = ut + \frac{1}{2}at^{2;}$ there is no mass. Therefore both bodies return to the ground at the same time.	
27.	Two bulbs each of resistance 5.0Ω are connected in parallel across two batteries each of emf 1.5V and internal resistance of 0.5Ω also in parallel. What is the current generated by the setup? A. 0.5A B. 1.0A C. 1.5A D. 2.0A	For batteries; $r = \frac{0.5 \times 0.5}{1.0} = 0.25\Omega$ For bulbs; $R = \frac{5.0 \times 5.0}{10} = 2.5\Omega$ Now from $E = I(R + r)$, $1.5 = I \times 2.75$ $I = 0.5A$ NB: We use emf of one battery (1.5V) not both.	**A**
28.	A body of volume $0.0002m^3$ and Density of $600kgm^{-3}$ floats in paraffin of density $800kgm^{-3}$. What fraction of the body remains exposed above the surface of paraffin? A. 3/20 B. 1/4 C. 3/4 D. 1/3	From the law of floatation, a floating body displaces its own weight of the fluid in which it floats hence its own mass; => folating mass = δ × volume folating mass = 600 × 0.0002 = 0.12kg Displaced volume of paraffin $= \frac{mass}{density} = \frac{0.12}{800} = 0.00015m^3$ Fraction immersed $= \frac{0.00015}{0.0002} = \frac{3}{4}$ Therefore fraction exposed $= 1 - \frac{3}{4} = \frac{1}{4}$	**B**
29.	A moving coil ammeter (i) measures only direct current (ii) has a permanent magnet (iii) measures only alternating current (iv) measures both alternating and direct current. A. (i) only B. (ii) and (iii) only C. (ii) and (iv) only D. (i), (ii), (iii) and (iv)	A moving coil ammeter measures both alternating and direct current and has a permanent magnet.	**C**
30.	The length of a constantan wire used in a school laboratory can accurately be measured by A. a micrometer screw gauge B. an engineer's calliper C. a vernier calliper D. a metre rule	Length of a constantan wire can accurately be measured by a metre rule while its thickness can accurately be measured by a micrometer screw gauge	**D**
31.	The following are units of derived quantities only	kg, m, s is for mass, length and time N, kgm^{-3}, m is for weight, density and mass	**D**

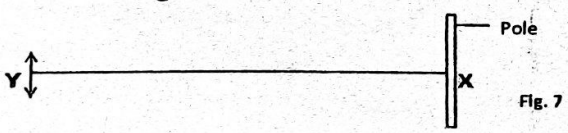
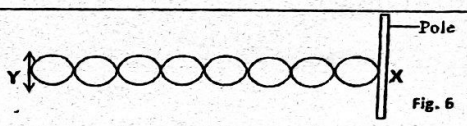
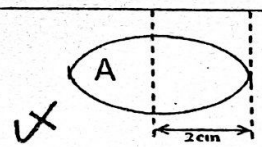
	A. kg, m, s B. N, kgm^{-3}, m C. s, N, ms^{-2} D. m^3, m^2, ms^{-1}.	s, N, ms^{-2} is for time, weight and acceleration m^3, m^2, ms^{-1} is for volume, area and speed/velocity.	
32	 A man stands 5m away from a sound source as shown in figure 4 above. He hears sound from the original source and three seconds later he hears an echo from the reflector. Determine the distance between the reflector and the source. A. 480m B. 485m C. 960m D. 965m	From the man to the reflector; $v = \frac{2d}{t}$ or $2d = vt$ => $2d = 320 \times 3 = 960m$ => $separation = \frac{960}{2} + 5 = 485m.$	**B**
33	A uniform meter rule of weight 1.05N is suspended by a spring of force constant $25Nm^{-1}$ at 30cm mark. The meter rule is also pivoted at 70cm mark. If a 5.0g mass is suspended at the 90cm mark, calculate the extension of the spring to obtain equilibrium. A. 2.0cm B. 4.0cm C. 6.0cm D. 8.0cm	**We 1st obtain the upward tension (T) in the spring:-** Clock wise moments = anticlockwise moments => by taking moments at the fulcrum; $1.05 \times 20 = T \times 40 + \left(\frac{5}{1000} \times 10\right) \times 20$ $21 = 40T + 1$; $40T = 20$; $T = 0.5N$ Now from $T = ke$; $e = \frac{T}{k} => e = \frac{0.5}{25} = 0.02m$ or **2cm**	**A**
34	A spherical object is viewed through the hole of a pinhole camera at a distance of 40m. If the length between the hole and the screen is 50cm and the height of the image is 4cm. What is radius of the object? A. 320cm B. 300cm C. 200cm D. 160cm	Magnification= $\frac{v}{u} = \frac{50}{4000} = 0.0125$ But also magnification= $\frac{h_i}{h_o}$ => $0.0125 = \frac{4}{h_o}$; $h_o = \frac{4}{0.0125} = 320cm$ Radius = 160cm	**D**
35	A metallic body of mass 250g was heated to a temperature of 100°C and then dropped into water of mass 100g at 30°C in a copper calorimeter of heat capacity $100JK^{-1}$. If the final temperature of the mixture is 50°C . Calculate the specific heat capacity of the body. A.$1018Jkg^{-1}K^{-1}$ B. $11400Jkg^{-1}K^{-1}$ C.$832Jkg^{-1}K^{-1}$ D. $10400Jkg^{-1}K^{-1}$	Heat loss by metal body $= \frac{250}{1000} \times (SHC) \times (100 - 50)$ $= (SHC) \times 12.5$ Heat gain by water and Calorimeter $= \frac{100}{1000} \times 4200 \times (20) + 100 \times 20$ $= 10,400J$ $(SHC) \times 12.5 = 10,400$ $SHC = 832Jkg^{-1}K^{-1}$	**C**

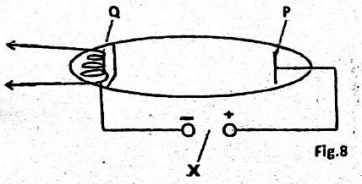
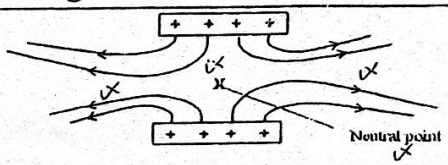
36	 Fig. 5 An empty bottle was immersed in hot water and then closed with a coin as shown in figure 5 above. When the bottle is immersed in cold water and turned upside down, the coin A. does not fall off because the pressure inside the bottle is greater than that outside the bottle. B. does not fall off because the pressure outside the bottle is greater than that inside the bottle. C. falls off because the pressure inside the bottle will equal to that outside the bottle, D. falls off because pressure inside the bottle is greater than that outside the bottle.	When the bottle is immersed in hot water the pressure inside the bottle rises. When the bottle is immersed in cold water the pressure inside the bottle falls although the atmospheric pressure remains constant. When the bottle is turned upside down, the coin does not fall off because the atmospheric pressure outside the bottle is greater than reduced pressure inside the bottle.	**B**
37.	A flat iron of resistance 10Ω is connected to the mains supply of 220V and it is used for 5 hours daily for 5days. If the cost of a unit is sh.1000 determine the amount of money consumed in that period. A. 100,000 B. 121,000 C. 110,000 D. 50,000	The energy in Wh consumed is: $\frac{V^2t}{R} = \left(\frac{220^2 \times 5 \times 5}{10}\right) = 121{,}000\text{Wh};$ Now energy in kWh $= \frac{\text{Wh}}{1000}$ $= \frac{121{,}000}{1000} = 121\text{units or kWh}$ *The money consumed* $= 121 \times 1000 = \text{sh. } 121{,}000$	**B**
38.	The forces acting on a stationary body in a viscous liquid are (i) up thrust (ii) viscosity (iii) weight A. (i) only B. (i), (ii) and (iii) C. (ii) and (iii) only D. (i) and (iii) only.	When a body is not moving in a viscous liquid viscous force does not act on it. So the forces acting on a body in that state are: up thrust and weight.	**D**
39	A T.V remote operating on a 6.0V d.c supply can draw power from a 240.0V mains by connecting it in A. series with a low resistance B. series with a high resistance C. parallel with a low resistance D. parallel with a high resistance.	A T.V remote operating on a 6.0V d.c can draw power from a 240.0V mains supply by connecting it in series with a high resistance	**B**

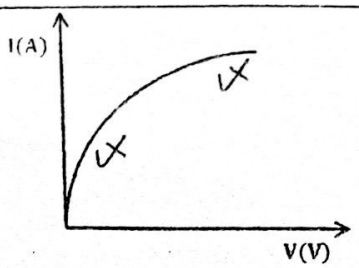
40	An electric heater is immersed in 0.05kg of oil in a calorimeter at 20^0C. The temperature of the oil rose to 323K in $\frac{1}{6}$ of a minute. If the specific heat capacity of oil is 2000Jkg^{-1}K^{-1} , calculate the power supplied by the heater. A. 100W B. 200W C. 300W. D. 400W	Change in temperature $=323-(273+20)=30^0$C Time for temperature change is 10seconds. Power $\frac{(mC\theta)}{(time)}=\frac{(0.05\times 2000\times 30)}{(10)}$ **=300W**	**C**

SECTION B

41.	(i) What is meant by plastic deformation	Permanent distortion that occurs when a material is subjected to tension, compression or bending. ✓	01
	(ii) State two factors which affect a body under plastic deformation.	The factors are stress and strain. ✗ ✗	01
(b)	Sketch an extension against load Graph of an elastic body and indicate on it elastic limit and yield point.		02
			04
42.(a)	(a) (i) State the law of conservation of linear momentum	When two or more bodies collide in a straight line, their total momentum is conserved provided no external force acts on them.	01
	(ii) Write any two applications of the law in (i) above.	Space rocket ✓ Jet engine ✗✗	01
(b)	A body of mass 5.0g moving with a velocity of 10ms^{-1} collides with a stationary body of mass 10g. If the 5g body moves backwards with a velocity of 5ms^{-1} after collision, find the velocity of the 10g mass body after collision.	**Before collision** P → u_1 Q; $m_1=5g$ $m_2=10g$; $u_1=10ms^{-1}$ $u_2=0ms^{-1}$ ✓ **After collision** v_1 ← P Q → $v_2=xms^{-1}$; $m_1=5g$ $m_2=10g$; $v_1=-5ms^{-1}$ $v_2=xms^{-1}$ $5\times 10+10\times 0=-5\times 5+10\times x$ ✗ $50+0=-25+10x$ $x=7.5ms^{-1}$ ✓✗ The 10_g body moves forward with a velocity of 75ms^{-1}	02
			04
43.	(a) Define Pressure and state its SI unit.	Force acting normally per unit square metre ✓ **Its SI unit is Nm^{-2}** **or Pa or pascals** ✓	02

	(b) A tap of cross-sectional diameter of 3.5cm is located at the base of a tank of height 4.0m to allow water out of it. Calculate the force at which water flows out of the tank.	Pressure = $h\delta g$ $= 4 \times 1000 \times 10 = 40{,}000Pa$ Force = P × area $= 40{,}000 \times \frac{22}{7} \times \left(\frac{3.5 \div 2}{100}\right)^2$ $= 40{,}000 \times \frac{22}{7} \times (0.0175)^2 = 38.5N$ Allow 38.465N	04
44	(a) Define absolute refractive index	This is the ratio of the speed of light in vacuum to the speed of light in a given medium.	01
	(b) A ray of light travelling from water to glass makes an angle of 60^o with the boundary as shown in figure...above. If the refractive indices of water and glass are 1.33 and 1.50 respectively, calculate angle alpha	$i^0 = 90 - 60 = 40^0$ From $n_1 sin\theta_1 = n_2 sin\theta_2$ $1.33 sin40^0 = 1.5 sinr^0$ $sinr^0 = \frac{1.33 sin40^0}{1.5}$; $r^0 = sin^{-1}\left(\frac{1.33 sin40^0}{1.5}\right)$ $r^0 = 34.7^0 \approx 35^0$ $\alpha^0 = 90 + 34.7 = 124.7^0$	03
			04
45.	(a) What is a stationary wave?	A wave which appears to be vibrating vertically not horizontally. It is created from waves with identical frequency and amplitude travelling in opposite directions.	01
	(b) The end X of a rope is tied to a pole while end Y is moved up and down as shown in **figure 7**.  Fig. 7 (i) sketch the resultant pattern between X and Y.	 Fig. 6	01 01
	(ii) A horizontal distance between a node an antinode of a standing wave is 2.0cm. If the frequency of the wave is 50Hz, calculate its velocity.	 $\lambda = \frac{2}{(100)} \times 4 = 0.08m$ $v = f\lambda = 50 \times 0.08 = 4.0ms^{-1}$	02
			04
46.	46. (a) (i) Define the term **Absolute zero**.	The temperature at which particles of a substance are assumed to have no kinetic energy.	01
	(ii) The cooling system of a refrigerator extracts heat at a rate of $0.7kJs^{-1}$. How long will it take to convert 500g at	$P \times t = mC\theta + ML$ $700 \times t = (0.5 \times 4200 \times 20) + 0.5 \times 2100$	02

	20°C into ice?		
	(b) State any two factors affecting melting point of copper.	Pressure Impurities Shape ✗ Molecule size. **(any two)**	01
			04
47.	(a) (i) Define Photoelectric emission	Process through which free electrons are emitted from metal surfaces after absorbing light. ✓	01
	(ii) State any two applications of photoelectric emission.	Photo cells (vacuum cells) ✗ Solar panels ✗	01
	(b)  Fig.8 The diagram in figure 8 above shows a thermionic tube. Name parts marked P and Q	P is the anode ✗ Q is the filament or the cathode ✗	01
	(c) State the function of the part labeled X	To accelerate the **electrons** towards the anode. ✓	01
			04
48.	(a) (i) What is meant by electrostatic induction?	The distribution of charge in one material under the influence of a nearby material that has charge. ✓	01
	(ii) State two uses of a gold leaf electroscope	Measuring the magnitude of charge ✗ Determining the nature and type of charge. ✗	01
	(b) Draw an electric field pattern for two positively charged parallel plates at a short distance apart.	 	02
			04
49.	(a) (i) State Ohm's law	The current flowing through a conductor between any two points is directly proportional to the voltage between the two points.	01
	(ii) Write any two advantages of alternating current over direct current	AC can easily be stepped up or down for convenience ✓ It is cheaper to generate AC than DC ✓	02

9.	(b) Sketch a current against voltage graph for a torch bulb.		01
			04
0.	(a) Distinguish between mutual and self-induction	Mutual induction is a process in which a change in current in one coil induces an emf in another coil. Self-induction is a process in which a change in current in one coil induces an emf in itself.	02
	(b) Electric power is generated at 11kV. Transformers are used to raise voltage to 440kV for transmission over long distances using cables. The output of the transformers is 19.8mW and they are 90% efficient. Calculate the input current.	Let the input power be x $\frac{90x}{100} = 19.8 \times 1{,}000{,}000$ $x = 22{,}000{,}000\text{W}$ From $P = IV$; $22{,}000{,}000 = I \times 11{,}000$ $I = 2{,}000\text{A}$(input current)	02
			04

END