


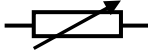

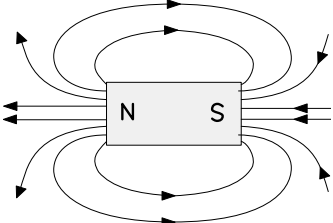


PHYSICS SEC MAY 2010 – MARKING SCHEME – PAPER IIB

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> | |
|---|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|------------------------------------------------------------------------------------------------------|-------------------|
| 1 | (a) | Bulb  | 1 | Accept as a  bulb | |
| | | Diode  | 1 | | |
| | | Variable resistor  | 1 | | Accept 'rheostat' |
| | | Ammeter  | 1 | | |
| | (b) (i) | $P = I \times V$ $P = 4 \times 240$ $P = 960 \text{ W or J/s}$ | 1 1 | For value For correct units | |
| | (ii) | 960 J per second | 1 | | |
| | (iii) | 5 A The fuse amperage is slightly more than the maximum current as a safety feature so that if the current increases the fuse will melt | 1 1 | Do not accept a different value from 5A | |
| | (iii) | Ohm's law states that the potential difference across an electrical conductor is proportional to the current Provided that the temperature remains constant | 1 1 | | |
| | (c) (i) | $0.5 - 0.4 = 0.1 \text{ A}$ | 1 | | |
| | (ii) | Across 40Ω $V = I \times R$ $= 0.4 \times 40$ $= 16 \text{ V}$ | 1 1 | For value For correct units | |
| | (iii) | 16 V The p.d. across resistors in parallel is equal | 1 1 | | |
| | (iv) | Across R $V = I \times R$ $16 = 0.1 R$ $160 \Omega = R$ | 1 for value, 1 for units | | |
| | (d) (i) | Thicker wire - (less resistance) - more current | 1 | If d(i) and (ii) are answered in terms of resistance and are both correct, then give 1 mark overall | |
| | (ii) | Longer wire - (more resistance) - less current | 1 | | |
| | | Total | 20 marks | | |


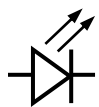
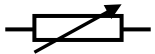

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|---|---------|-------------------------------------------------------------------------------------------|--------------------|--------------------------------------------------|
| 2 | (a) | 24 hours | 1 | Accept '1 day' |
| | | 365 days | 1 | Accept '1 year' |
| | (b) | Gravitational force | 1 | Accept the mass and velocity |
| | (c) | Communication / military communication; | 1 | |
| | | high orbit above equator / seems to be in a fixed position | 1 | |
| | | Monitoring weather / spying | 1 | |
| | | low orbit around the poles many times a day | 1 | |
| | (d) (i) | Gas, dust | 1,1 | |
| | (ii) | Gravitational force | 1 | |
| | (iii) | A star gives out its out light, a planet reflects the light of a star | 1 | |
| | | A star has planets orbiting around it; a planet has satellites (moons) orbiting around it | 1 | |
| | (e) (i) | A galaxy is a collection of solar systems | 1 | |
| | (ii) | Milky Way | 1 | |
| | (f) (i) | Red Shift | 1 | |
| | | Moving | 1 | |
| | | Faster | 1 | |
| | | Expanding | 1 | |
| | | Universe | 1 | |
| | | Big Bang | 1 | |
| | | Total | 20 marks | |
| 3 | (a) (i) | 6 | 5 marks 3 marks | All correct One pair mixed up Else 0 marks |
| | | 4 | | |
| | | 2 | | |
| | | 1 | | |
| | | 3 | | |
| | | 5 | | |
| | (ii) | temporary | 1 | |
| | | permanent | 1 | |
| | (iii) |  | 1 | For shape of field |
| | | | 1 | For correct direction of field |

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> | | | | | | |
|-------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------------------|------|---------|-------|----------|-------------|------------------------------------------------------------------------------------------------------------------------------|
| | (iv) | The needle of the compass will point away from the north pole of the bar magnet and towards the south pole of the bar magnet | 1 1 | | | | | | | |
| | (b) (i) | The rod became charged | 1 | | | | | | | |
| | (ii) | Because a charged object exerts an attractive force toward charged and / or non-charged objects | 1 1 | | | | | | | |
| | (iii) | Repulsion between like charges Attraction between unlike charges | 1 1 | | | | | | | |
| | (iv) | + ve charge - Perspex / acetate / glass - ve charge - polythene / polyester / PVC | 1 1 | | | | | | | |
| | (v) | Fuel tankers make use of a length of chain dangling to the ground to dissipate charge / Lightning conductors on buildings dissipate charge to the ground / Airport trolleys may have a small piece of conductor dangling to the ground to dissipate accumulated charge | 1,1 | Any suitable answer | | | | | | |
| | | Total | 20 marks | | | | | | | |
| 4 | (a) (i) | 226 88 | 1 1 | | | | | | | |
| | (ii) | <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td>Alpha</td> <td>α</td> </tr> <tr> <td>Beta</td> <td>β</td> </tr> <tr> <td>Gamma</td> <td>γ</td> </tr> </table> | Alpha | α | Beta | β | Gamma | γ | 1 1 1 | To obtain 1 mark both the name and symbol must be correct. If all text is correct but symbols are wrong, give overall 1 mark |
| Alpha | α | | | | | | | | | |
| Beta | β | | | | | | | | | |
| Gamma | γ | | | | | | | | | |
| | (b) (i) | Gamma | 1 | | | | | | | |
| | (ii) | Beta | 1 | | | | | | | |
| | (iii) | Alpha | 1 | | | | | | | |
| | (c) (i) | 0.5 g 0.25 g | 1 1 | Accept $\frac{1}{2}$ and $\frac{1}{4}$ | | | | | | |
| | (ii) | No Its half life is very long - 1600 years | 1 1 | Accept similar answers | | | | | | |
| | (d) (i) | ${}^1_1\text{H}$ ${}^3_1\text{H}$ | 1 | Both need to be correct | | | | | | |
| | (ii) | GM tube | 1 | | | | | | | |
| | (iii) | A GM tube is brought close to the plant, a short, | | | | | | | | |

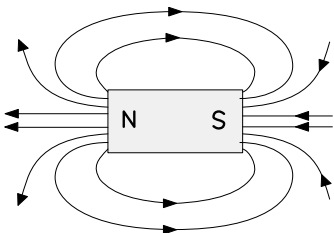
| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> | | | | |
|----|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------------------------------------|----|---------|------------|--|
| | | fixed distance above the soil The plant is watered using radioactive water and a stop watch started Once the GM tube starts to detect radiation, both the height above the soil and the time are noted. The GM tube is moved to a higher point and the process is repeated. | 1 1 1 1 | | | | | |
| | (iv) | A small amount of radioactive water is used / body contact with radioactive water is avoided / protective clothing | 1,1 | Any other plausible answer | | | | |
| | | Total | 20 marks | | | | | |
| 5 | (a) (i) | Both touched the ground together Since on the moon there is a vacuum, both were equally attracted by the moon's gravitational force | 1 1 | Accept 'there is no air resistance on the moon' | | | | |
| | (ii) | Hammer Due to air resistance, the feather will take longer to touch the ground | 1 1 | | | | | |
| | (b) (i) | <table border="1" style="display: inline-table; vertical-align: middle;"> <tr> <td style="width: 50px; text-align: center;">0</td> <td style="width: 50px; text-align: center;">m/s</td> </tr> <tr> <td style="text-align: center;">10</td> <td style="text-align: center;">m/s^2</td> </tr> </table> | 0 | m/s | 10 | m/s^2 | 1,1 1,1 | |
| 0 | m/s | | | | | | | |
| 10 | m/s^2 | | | | | | | |
| | (ii) | Both the orange and the grape reached the ground together | 1 | | | | | |
| | (c) (i) | Measuring tape Stop watch | 1 1 | | | | | |
| | (ii) | So that air resistance will not interfere with the falling mass as it is small compared to the weight | 1 | | | | | |
| | (d) (i) | electromagnet, timer trapdoor / circuit breaker | 1 1 1 | | | | | |
| | (ii) | s - distance a - acceleration due to gravity t - time | 1 1 1 | | | | | |
| | (iii) | Reliability of results / more accurate results | 1 | | | | | |
| | (iv) | Ball is dropped and timer is started instantly / Ball touches the ground and timer is switched off instantly | 1 | Accept 'reduce human error' or 'reaction time' | | | | |

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|--|--|---------------|--------------|------------------------------|
| | | Total | 20 marks | |

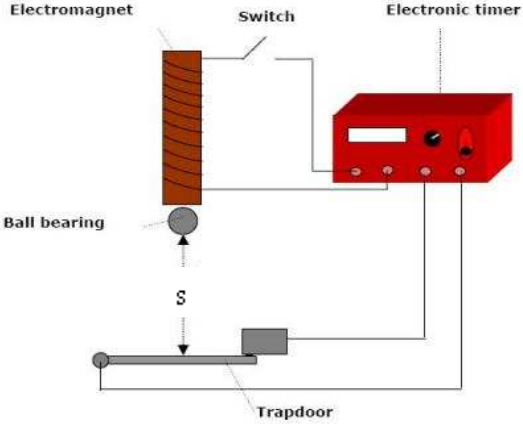
PHYSICS SEC MAY 2010 – MARKING SCHEME – PAPER IIA

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|---|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------|
| 1 | (a) | LDR  | 1 | |
| | | LED  | 1 | |
| | | Variable resistor  | 1 | |
| | | Thermistor  | 1 | |
| | (b) (i) | $P = I \times V$ $960 = I \times 240$ $4 \text{ A} = I$ | 1 1 | For value For correct units |
| | (ii) | 5 A The fuse amperage is slightly more than the maximum current as a safety feature so that if the current increases the fuse will melt | 1 1 | Do not accept 4.5 A or 6 A |
| | (iii) | $V = I \times R$ or $P = V^2/R$ $240 = 4 \times R$ $960 = 240^2 / R$ $60 \Omega = R$ $R = 60 \Omega$ | 1 1 | For value For correct units |
| | (iv) | 960 J per second or W | 1 1 | For value For correct units |
| | (c) (i) | $0.5 - 0.4 = 0.1 \text{ A}$ | 1 | |
| | (ii) | Across 40Ω $V = I \times R$ $= 0.4 \times 40$ $= 16 \text{ V}$ Across R $V = I \times R$ $16 = 0.1 R$ $160 \Omega = R$ | 1 1 | Other methods may be used to arrive at the same answer |
| | (d) (i) | Across 3Ω resistor $V = I \times R$ $= 1.25 \times 3$ $= 3.75 \text{ V}$ p.d. across X $= 6 - 3.75 = 2.25 \text{ V}$ Across X $V = I \times R$ $2.25 = 1.25 \times R$ $X = 1.8 \Omega$ | 1 1 1 | Other methods may be used to arrive at the same answer |

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|---|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-------------------------------------------------------------------------------------------------------------------------|
| | (ii) | Current is proportional to thickness | 1 | Accept the thicker the resistor the lower the resistance or vice-versa; Thicker wire - (less resistance) - more current |
| | (iii) | Current is inversely proportional to length | 1 | Longer wire - (more resistance) - less current |
| | | Total | 20 marks | |
| 2 | (a) | Earth spins upon itself every 24 hours Earth orbits the sun every 365 days | 1 1 | Accept an answer in terms of motion only without giving the time |
| | (b) | Gravitational force | 1 | Do not accept 'gravity' only or 'centripetal force' |
| | (c) | Monitoring weather - polar satellite; low orbit around the poles many times a day Communication - geostationary satellite; high orbit above equator / seems to be in a fixed position | 1,1 1,1 | |
| | (d) (i) | Gas and dust come together due to gravitational forces. | 1 1 | |
| | (ii) | Planets | 1 | |
| | (iii) | A star gives out its own light, a planet reflects the light of a star A star has planets orbiting around it; a planet has satellites (moons) orbiting around it | 1 1 | Do not accept that a star has a larger mass than a planet |
| | (e) (i) | A galaxy is a collection of solar systems | 1 | Do not accept 'group of stars' only |
| | (ii) | Milky Way | 1 | |
| | (f) (i) | Red Shift | 1 | |
| | (ii) | Galaxies are moving away from us | 1 | |
| | (iii) | The further away the galaxy is, the faster it is moving away from us | 1 | |
| | (g) | Big Bang Theory suggests that all the matter in the universe was concentrated into a single incredibly tiny point. This began to enlarge rapidly in a hot big bang and it is still expanding. The big bang was initially suggested because it explains why distant galaxies are travelling away from us at great speeds. | 1 1 1 | |
| | | Total | 20 marks | |

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|---|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3 | (a) (i) | Place one end of one bar close to but not touching the other and feel the force between them If a force of attraction is noticed, turn around one of the bars If an attractive force is again noticed, then one of the bars is a magnet and the other is just made of magnetic material / metal If at any stage, a repulsive force is noticed, then both bars must be magnets | 1 1 1 1 | Do not accept experiment using iron filings If experiment includes use of magnetic compass around magnet and around metal bar, give a maximum of 3 marks |
| | (ii) | Steel Since it has retained its magnetism for a long time, it must be a permanent magnet | 1 1 | Accept 'hard iron' |
| | (iii) |  | 1 1 | Shape of field Correct direction of field lines |
| | (iv) | The needle of the compass will point away from the north pole of the bar magnet and towards the south pole of the bar magnet | 1 1 | |
| | (b) (i) | Electrostatic induction The rod acquires an electrostatic charge which attracts uncharged objects | 1 1 1 | 'Induction' only is not correct |
| | (ii) | The two charged rods are tied separately to two lengths of nylon and brought close to each other If they attract each other the unknown rod is negative / have unlike charge If they repel each other the unknown rod is positive / have like charge | 1 1 1 | |
| | (iii) | +ve - Perspex / acetate / glass -ve - polythene / polyester / PVC | 1 1 | |
| | (iv) | Fuel tankers make use of a length of chain dangling to the ground to dissipate charge / Lightning conductors dissipate charge to the ground / Airport trolleys may have a small piece of conductor dangling to the ground to dissipate accumulated charge | 1,1 | Any suitable answer |
| | | Total | 20 marks | |

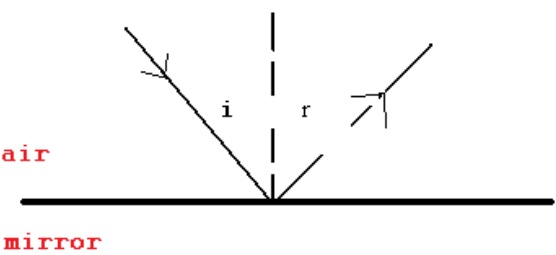
| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|---|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------------------------------------------|
| 4 | (a) (i) | Isotopes are atoms of the same element having the same atomic / proton number But different mass / nucleon number | 1 1 | |
| | (ii) | A GM tube is brought close to the plant, a short, fixed distance above the soil The plant is watered using radioactive water and a stop watch started Once the GM tube starts to detect radiation, both the height above the soil and the time are noted. The GM tube is moved to a higher point and the process is repeated. | 1 1 1 1 | |
| | (iii) | A small amount of radioactive water is used / body contact with radioactive water is avoided | 1,1 | Any other plausible precaution |
| | (iv) | To detect uniform thickness of materials / to detect leakages in underground pipelines | 1 | Do not accept 'treatment of cancer' as this is not an industrial use |
| | (b) (i) | Mass number - 226 Atomic number - 88 Number of protons - 88 Number of neutrons - 138 | 1 1 1 1 | |
| | (ii) | Half life is the time taken for half the atoms in a radioactive element to decay | 1 | |
| | (iii) | 1600 → 1600 → 1600 = 4800 years 1 → 1/2 → 1/4 → 1/8 | 1 1 | |
| | (iv) | The alpha particle would definitely not be able to pass through the watch glass, The beta particle may pass and The gamma will pass. However, given the small amount of radium present, the amount of gamma radiation would be small. Not very dangerous to wear but better not to. | 1 1 1 1 | |
| | | Total | 20 marks | |
| 5 | (a) (i) | Both touched the ground together Since on the moon there is a vacuum, both were equally attracted by the moon's gravitational force | 1 1 | Accept 'there is not frictional force due to air resistance' |
| | (ii) | Hammer | 1 | |

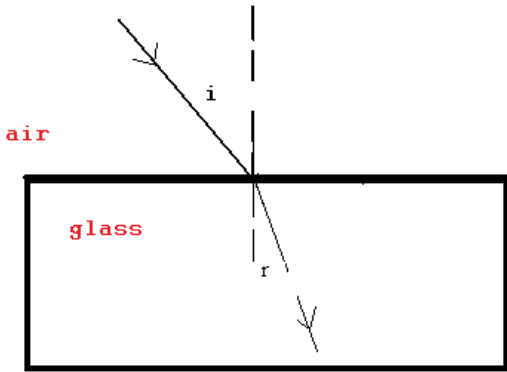
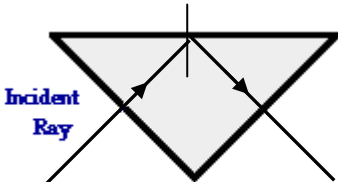
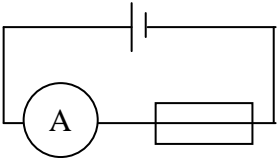
| | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | Due to air resistance, the feather will take longer to touch the ground | 1 | |
| (b) (i) | Initial velocity = 0 / let to fall from rest / were not pushed | 1 | |
| (ii) | Measuring tape; stopwatch | 1,1 | |
| (iii) | Timer not started exactly as the moment that the match box was dropped | 1 | Any other reasonable answer |
| (iv) | Repeated readings | 1 | Do not accept, centisecond timer is brought home from school |
| (c) (i) |  <p>Correct diagram, including electromagnet, timer and trapdoor</p> | 1 1 1 | If light gates are used instead of the trap door system, ensure that one of the light gates is at the position where the ball starts from rest. Otherwise, reduce 1 mark from diagram, 1 mark from method and 1 mark from how value of 'a' is obtained. |
| (ii) | <p>As soon as the electromagnet circuit is switched off, the ball drops and the centisecond is automatically switched on</p> <p>When the ball touches the trap door, this opens, the centisecond stops and the time is noted.</p> <p>Distance 's' is measured using a ruler.</p> <p>Time taken is read from centisecond timer</p> <p>Results are presented in a table</p> <p>Using the equation $s = \frac{1}{2} at^2$ the acceleration due to gravity is calculated</p> <p>Repeated readings are taken</p> | 1 1 1 1 1 1 1 | Accept indication that a graph is drawn of 's' vs 't ² ' and the value of 'a' is the value of the gradient of the graph multiplied by 2 |
| (iii) | At school ball is dropped and timer is started instantly / Ball touches the trap door and timer is switched off instantly | 1 | |
| | Total | 20 marks | |

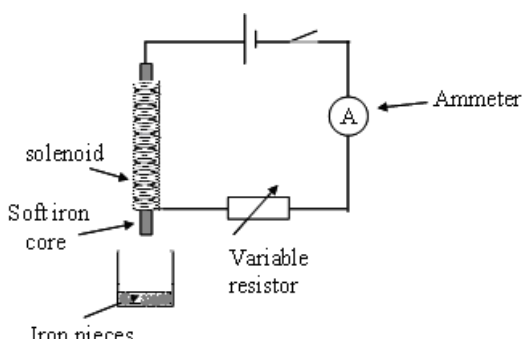
PHYSICS SEC MAY 2010 – MARKING SCHEME – PAPER I

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|---|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------------------------------------------------------------------------------------------------|
| 1 | (a) | Digital weighing apparatus / weighing apparatus / weighing balance / beam balance / top pan balance / electronic balance. Kilograms / kg | 1 1 | 'Balance' only is not accepted 'Scales' is not accepted 'grams' is not accepted |
| | (b) | An amount of water is measured in a measuring cylinder Soldier is placed in water. The new volume of water is noted The volume of water displaced is equal to the volume of the soldier toy | 1 1 1 | Same method using displacement / eureka can method is acceptable Accept 'subtract / difference / minus' |
| | (c) | $\rho = m / V$ $= 116 / 20$ $= 5.8 \text{ g / cm}^3$ or 5800 kg/m^3 | 1 1 | For value For correct units |
| | (d) (i) | Wood, cork, jablo, plastic, etc. | 1 | Any other material which is commonly known to float on water. Do not accept 'paper' |
| | (ii) | Any value less than 1 The density of a material which floats on water must be less than the density of water | 1 1 | Accept 'value less than that of water' |
| | | Total | 10 marks | |
| 2 | (a) (i) | Gravity / force of gravity / weight / load | 1 | Do not accept 'force' |
| | (ii) | Force | 1 | |
| | (iii) | Gravitational potential | 1 | Accept 'potential' |
| | (b) | Work done = $F \times s$ $= 250 \times 10 \times (3 \times 3.5)$ $= 26,250 \text{ J}$ or 26.25 kJ | 1 1 | Accept method using $PE = mgh$ For value For correct units |
| | (c) | Power = Energy / time $= 26,250 / (2 \times 60)$ $= 218.75 \text{ J/s}$ or W | 1 1 | For value For correct units |
| | (d) | Efficiency = (power output / power input) x 100 $= (218.75 / 437.5) \times 100$ $= 50 \%$ or 0.5 | 1 1 | For value For correct units |
| | (e) | Energy is converted to work done against frictional forces, whilst some is wasted as sound energy, etc / energy required for lifter to lift its | 1 | The term 'friction' only is not acceptable |

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|---|---------|--------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------|
| | | platform | | |
| | | Total | 10 marks | |
| | | | | |
| 3 | (a) | Momentum before collision is equal to momentum after collision provided that no external force acts on the system | 1 1 | |
| | (b) (i) | 0 kgm/s | 1 | |
| | (ii) | Momentum = m x v = 1600 x 20 = 32000 kgm/s or Ns | 1 1 | For value For correct units |
| | (c) (i) | 32000 kgm/s | 1 | |
| | (ii) | Momentum after = (M + m)v 32000 = (2400 + 1600) v 8 m/s = v | 1 1 | For value For correct units |
| | (iii) | KE = $\frac{1}{2}mv^2$ = 0.5 x (1600 + 2400) x 8 x 8 = 128,000 J or 128 kJ | 1 1 | For value For correct units |
| | | Total | 10 marks | |
| | | | | |
| 4 | | v = u + at 0 = 9 + (a x 0.1) = - 90 m/s ² Accept '90m/s ² ' as question | 1 | For value |
| | (a) | already refers to deceleration | 1 | For correct units |
| | | F = m a = 1000 x 90 = 90,000 N | 1 1 | For value For correct units |
| | (b) | | | |
| | (c) | 90,000N Newton's 3 rd law of motion / for every force on one body there is an equal and opposite reaction force on some other body | 1 1 | Accept answers which state that the 90,000N is in the opp. Direction |
| | (d) | To crumple, the car takes a longer time to stop, so it will decelerate less and the force involved would be smaller | 1 1 | |
| | (e) | Seat belts / air bags / head restrains / tampered glass etc. | 1,1 | any reasonable answer; do not accept 'upgraded brakes' or 'bull bars' |
| | | Total | 10 marks | |
| | | | | |

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|---|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------------------------------------|
| 5 | (a) | Correct scale Correct axes Correct points marked Size of graph at least half of graph paper | 1 1 1 1 | |
| | (b) | Directly proportional | 1 | Do not accept 'proportional' only |
| | (c) | At 250 Hz, \sqrt{T} is $2.35 \pm 0.05N$ $T = 2.35^2$ $T = 5.5 \pm 0.26N$ | 1 1 | |
| | (d) | Paper rider is placed on stretched wire, The students strike the tuning forks one after the other, touching the string with its stem, When the rider vibrates and falls off, tuning fork frequency is equal to natural frequency of wire | 1 1 1 | Accept answers which state that ' |
| | | Total | 10 marks | |
| | | | | |
| 6 | (a) (i) | Carpet is an insulator Tile floor is a poorer insulator of heat Tile floor feels colder as heat is transferred from her foot to the tile | 1 1 1 | Accept 'better conductor of heat' |
| | (ii) | Conduction, convection, radiation | 1,1,1 | |
| | (b) (i) | Vacuum prevents / reduces heat transfer By conduction | 1 1 | By convection |
| | (ii) | Aluminium reflects back heat radiation / bad absorber | 1 | |
| | (iii) | Copper is a good conductor of heat | 1 | 'Good absorber of heat' is not accepted |
| | | Total | 10 marks | |
| | | | | |
| 7 | (a) (i) |  | 1 | If arrows are not shown, give 0 marks For correct diagram |

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|---|---------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------------------------------------------------------------------------------------------------------------------|
| | |  | 1 | <p>If arrows are not shown give 0 marks</p> <p>For correct diagram</p> |
| | (ii) | On diagram for correctly marked angles | 1,1 | |
| | (iii) | <p>air - mirror</p> <p>air - glass / Perspex / water</p> | 1 1 | Accept also, 'glass with silvered back or glass of mirror'. Do not accept 'glass' only |
| | (b) (i) |  <p>Correct direction of emergent ray</p> <p>Indication of normal / angle of incidence & angle of reflection</p> | 1 1 | <p>If arrow is not shown give 0 marks for direction of emergent ray.</p> <p>Accept 90° angle instead of normal</p> |
| | (ii) | <p>Angle of incidence is greater than critical angle</p> <p>Light is travelling from a more dense medium to a less dense medium</p> | 1 1 | |
| | | Total | 10 marks | |
| 8 | (a) (i) | <p>Yellow / green</p> <p>Brown</p> <p>Blue</p> | 1 1 1 | Do not accept any other colours |
| | (ii) | Safety / protects people / carries current during fault / prevents a person from electrocution | 1 | |
| | (b) (i) |  <p>Correct symbols</p> <p>Components in series</p> | 1 1 | |

| | | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|----|---------|---------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------|
| | (ii) | A current flowing through the ammeter indicates that fuse is working properly | 1 | |
| | (iii) | A variable resistor / rheostat | 1 | |
| | (iv) | In series with the fuse | 1 | |
| | (v) | Resistance is inversely proportional to current | 1 | Accept 'when resistance increases, current decreases' and vice-versa. |
| | | Total | 10 marks | |
| 9 | (a) (i) | Renewable energy sources can be used over and over again. Non-renewable energy sources can only be used once. | 1 1 | Accept 'renewable energy is infinite whilst non-renewable is finite' |
| | (ii) | Renewable - wind / solar / biomass / biodiesel Non-renewable - fossil / nuclear / fuel / wood | 1 1 | Any suitable answer |
| | (b) (i) | Non-renewable | 1 | |
| | (ii) | Generate a lot of energy / relatively cheap / efficiently | 1 | Any suitable answer |
| | (iii) | Petrol / diesel / aviation fuel / gas / coal | 1,1 | Any suitable answer |
| | (iv) | Wind energy → electrical energy → kinetic energy + heat + sound Or Wind energy → K.E. → electrical energy | 1,1 | |
| | | Total | 10 marks | |
| 10 | (a) (i) |  <p>Solenoid, battery, switch / resistor</p> | 1, 1, 1 | If setup cannot be used correctly then give 0 marks |
| | (ii) | As the number of turns of coil increases the strength of the magnetic field of the solenoid increases | 1 | |
| | (iii) | Insert a thicker iron core in the solenoid / current | 1 1 | Accept 'insert an iron core' |
| | (b) (i) | The electric current through the coil induces a magnetic field in the iron core | 1 | Accept, 'it becomes magnetized' |

| | <i>Answer</i> | <i>Marks</i> | <i>Additional guidelines</i> |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|------------------------------|
| (ii) | The soft iron armature is attracted to the iron core, pulling the hammer with it | 1 | |
| (iii) | At the contact point / when the armature is attracted / release the switch when it hits the gong | 1 | |
| (iv) | The soft iron armature is no longer attracted to the iron core and is pulled back to its original position by the spring / no longer magnetised / released | 1 | |
| | Total | 10 marks | |