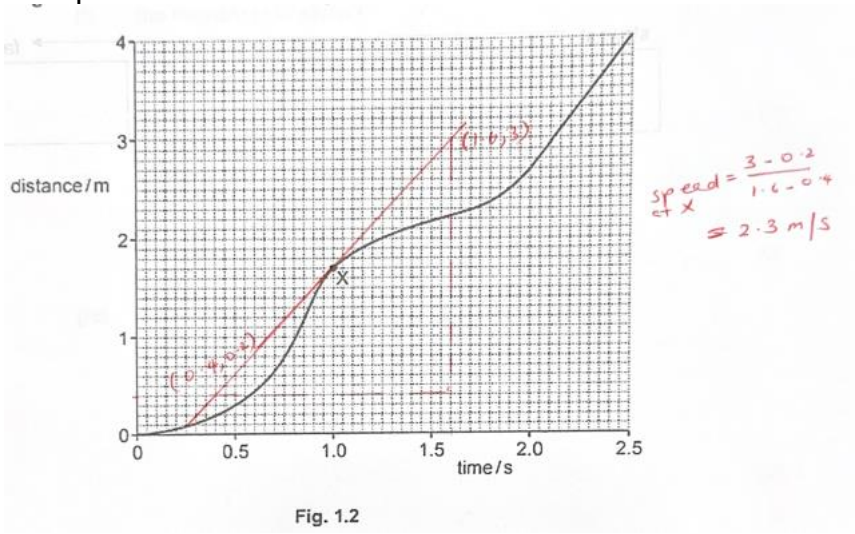
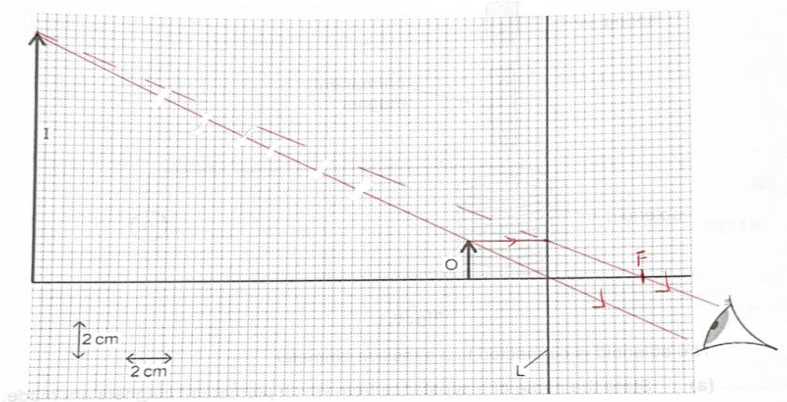
Qn	Answer	Remarks
1	1(a)(i) P marked in region t = 0 – 0.8 s or in region 1.6 –2.0 s Q marked between 2.0 and 2.5s 1(a)(ii) Must **draw tangent** drawn at **X** eg: speed = (3-0.2)/(1.6-0.4) = 2.3 m/s Accept: 1.9 m/s –2.4 m/s  Fig. 1.2 1(b) $v_A < v_C < v_D < v_B$	Did not put a point. Badly done. Did not draw tangent. Simply use 1.7/1 Use A, B, C instead of V_A
2	2(a) P × 1.5 2(b)(i) moment of W = 210 × 1.0 = 210 Nm 2(b)(ii) clockwise moment = anti clockwise moment P × 1.5 = 210 P = 210 / 1.5 = 140 N 2(b)(iii) P + Q = 210 140 + Q = 210 Q = 210-140 = 70 N Or Q × 1.5 = 210 × 0.5	ok

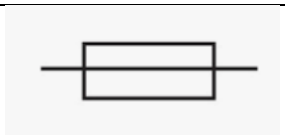
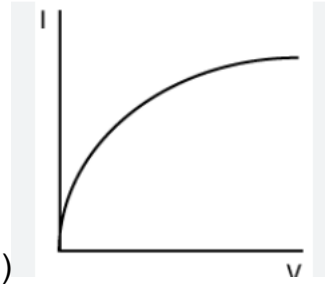
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	Q = 210 × 0.5 / 1.5 Q = 70 N	
3	3(a) in a system, energy **cannot be created or destroyed**. It can only be **transferred** from one **store** to another, and the **total energy remains constant.** 3(b)(i) **Chemical potential energy of the girl** is transferred to **kinetic energy** of ball. The **KE of the ball is** transferred **to gravitational Potential Energy** when the ball reaches its **highest height**. When falling, **gravitational Potential energy of the ball is** transferred **to kinetic energy.** **Kinetic energy of the ball is transferred to thermal energy** (or internal energy) when it hits the ground and stops moving 3(b)(ii) a = (v – u) / t a = (12-0)/0.6 = 20 m/s^2 F = ma = 4 x 20 = 80 N	Not able to quote. Use 'converted' instead of 'transferred' Many did not state 'Chemical potential energy' of girl okay
4	2(a)(i) The steam particles **hit/collides with sides of container (or piston)** **and each hit creates a small force.** **The average force per unit area gives rise to pressure.** 2(a)(ii) When the temperature increases, the particles **move faster and have higher kinetic energy**. They hit the sides of the wall **more frequently** and with **larger force on each hit.** **The average force per unit area increases thus pressure increases.** 2(b) Pressure difference = 2.1 x 10^6 – 1.0 x 10^5 = 2.0 x 10^6 Pa Resultant force = P × A = 2.0 x 10^6 x 0.00003 = 60 N	Words in bold missing Hit harder omitted by many. Quite a number did not convert 0.30 cm^2 to m^2
5	(a)(i) object within focal length (less than focal length) (a)(ii) any one: from divergent (or parallel) rays or rays do not meet on a screen / do not converge	Some stated wrongly Almost all cannot explain

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	or rays appear to come from image (b)(i)  **Fig. 5.3** (scale: 1 cm represents 2 cm) • ray through optical centre from top of object • ray parallel to axis from top of object to lens and line from junction with lens to top of image • both rays extended back to image **and** ray parallel to axis correctly refracted through lens to appear to come from top of image (b)(ii) 4.0 cm	Arrows not drawn. Rays drawn wrongly.
6	(a) steel (b)(i) **Magnetic field lines of magnet are cut** by the solenoid and electromotive force is induced. **Electromotive force e.m.f. cause current** to flow in a closed circuit. (b)(ii) Lenz's law states that the direction of the induced current is such that its magnetic effect always opposes the change producing it. To repel the downward motion of the Soth pole of the magnet, the magnetic effect of the induced current must produce an upward force ,thus a south pole must be produced at the top end of the solenoid as like poles repel. (b) Current changes **direction when magnet oscillates up and down** and the **magnitude of induced current changes**.	Ok Lose mark for not explaining clearly why there is a current flow. (which is due to e,m,f in a closed circuit)

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7	(a)  (b)(i)  (b)(ii) At higher current (or voltage), the **temperature increases, and resistance increases.** (c) $R_{total} = (1/40 + 1/60)^{-1}$ $= 24\ \Omega$ I = V/R = 240/ 24 = 10 A	Wrong symbol Many cannot give correct graph Many cannot explain fully.
8	9(c)(i) Background radiation is the count that is always present due to the environment / surroundings or not deliberately introduced or not being tested any two from: • rock sources (e.g. benches, building materials, human body, Earth crust) • air sources (e.g. radon) • cosmic sources (e.g. Sun, space)	Ok Did not read question carefully and just gave any random- like in hospital even though question said what the teacher measured in the lab. Infra-red radiation cannot be detected by radioactivity detector – only alpla, beta and gamma (which are ioniing

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	9(c)(ii) use **tongs** / tweezers / forceps or wear **lead-lined** clothing / **lead-lined** gloves or wear goggles or **reduce time of exposure** or **keep distance of separation large**	radiation) can be detected. Lead-lined not given when gloves or protective gear were mentioned.
	9(c)(iii) (radioactive) emission is **a random process** and occurs at random intervals. Thus, **measurements fluctuate** about an average value	Cannot explained clearly.
	9(c)(iv) Must measure a few half-lives and take average. Or take from 2 readings that are at least 2 half-lives apart. e.g. (0, 58) and (138, 14.5) 66.0 s $\leqslant$ Half -life $\leqslant$ 73.5 s	Only take one half-life thus no full credit given.
	9(c)(v) (large half-life because of) slow rate of decay B1 radiation / count rate due to $^{234}_{92}U$ imperceptible / very much less than that of 234 91Pa or (nearly) all of measured radiation / count rate due to 234 91Pa B1	
9	9(a) Total current = 450 + 34 = 484 mA = 0.484 A P = IV = (0.484)(230) = 111.32 W = 111 W (3s.f) (b) (i) $P_{standby}$ =IV = (0.034)(230) = 7.82 W E = Pt = 7.82 x (138 x 60 x 60) = 3.88 x 10^6 J (ii) 1kWh = 1000 x 60 x 60 = 3.6 x 10^6 J E= 3.88 x 10^6/3.6 x 10^6	Generally okay. Wrong formulae used or wrong values used.

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	= 1.08 kWh Cost = 1.08 x 0.25 = 27 cents C(i) Both the television and computer have the **same amount** of **current** in the standby circuit when the appliances are in standby mode, which means they use energy at the same rate when in the standby mode. **Since the television is in the standby mode for more hours per week**, unplugging the television saves more energy. (ii) The computer is used for **more hours per week**, therefore it may be **more inconvenient to keep plugging and unplugging** the computer	Cannot do by many Cannot do by most
10	Metal contains free electrons. These f**ree electrons gain internal energy at the heated end and move at high speed from hot area to cold area**. The **electrons collide with particles and pass on** the energy at the cooler end. b(i) 0 ^{o}C b(ii)The heat energy is used to **increase the potential energy of the molecules to weaken the intermolecular force and not the KE of the molecules**. The **particles move further apart** to overcome the intermolecular forces.	'Particles' was used instead of free electrons. 'Move further apart' is missing in many answers. Only state PE has no credit given.
	(b)(iii) Q = mc$\Delta\Theta$ = 1.5 x 2100 x (15) = 47250 = 47000 J (2 sf) (b)(iv) P = E / t = 47250/ (2 x 60) = 393.75 (W) = 390 W (2sf) (b)(v) water has a **higher** specific heat capacity	Generally, okay except for weaker students who cannot sub in correct values or used wrong formulae. Many wrong explanation.
11	(a) By friction, **electrons move from the cloth to the rod**. The cloth becomes **positively charged.**	Ok. Some did n ot state what happened to the cloth.

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	(b) Metals contain free electrons. Plastic does not contain free electrons. (c)(i) • positive signs at top half of sphere and negative signs at the bottom • equal number of each and number ⩽ more than 3 less than 7. (c)(ii) The **electrons flow to earth** and positive charges do not move. (c)(iii) Only t**he top of sphere stays positive.** **Bottom of sphere is uncharged / neutral.** (c)(iv) When Earth wire is disconnected and rod is removed, **electrons flow from bottom (low potential) to top (high potential) till every part of the sphere is at the same potential**. This caused **the positive charge to spread uniformly** over the surface of the sphere.	Ok Okay. Some bad drawing. (i) No mark for stating 'Electron get neutrailsed/ grounded' as it did not give a clear idea how the electrons move. Weaker students cannot see this part. Cannot explained fully by many.
12	(a)(i) magnetic field or magnet (b)(i) The **current in coil continually reverses direction** and causes **the force on the coil continually reverses.** Since the forces keeps changing direction, the coil vibrates lef and right continually.	This question is less popular. Attempted by a small number. ok

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	(b)(ii) when the cone moves **outwards and inwards alternately, layers of air are pushed together and pulled further apart alternately respectively.** Therefore, **a series of compressions and rarefactions move away** from the cone at the speed of sound. Hence, sound is propagated in the form of l**ongitudinal waves such that the particles in the medium vibrate backwards and forwards in a direction parallel to the direction** of propagation of the wave itself. (b)(iii) Period, T = 0.0050 s Frequency = 1/T = 1/0.005 = 200 waves Therefore number of times cone reverse direction = 200 x 2 = 400 times per second (b)(v) $V = f \lambda$ $\lambda = V / f$ = 340 / 200 = 1.7 m (c)(i) **Loudness decreases** as amplitude of sound vibration decreases (c)(ii) Pitch stays the same (unchanged) as there is no change to frequency.	

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1 A	**2** B	**3** A	**4** D
5 B	**6** B	**7** B	**8** A
9 C	**10** A	**11** D	**12** C
13 C	**14** C	**15** A	**16** A
17 B	**18** B	**19** A	**20** C
21 C	**22** B	**23** A	**24** A
25 A	**26** B	**27** C	**28** B
29 B	**30** B	**31** C	**32** A
33 C	**34** B	**35** A	**36** A
37 D	**38** C	**39** D	**40** D

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