Paper 1 Practice questions (AS Level) Answers

Question	Answer	Marks
Section A		
1	C	
2	A	
3	A	
4	C	
5	C	
6	B	
7	B	
8	C	
9	A	
10	C	
11	A	
12	A	
Section B		
1	Time period = 1.6 ms $f = \frac{1}{1.6 \times 10^{-3}}$ = 630 Hz (2 s.f.)	1 1 1
2 a	35(.4)	1
2 b	2.8 m	1
2 c	power = $\frac{1}{2.8} + \frac{1}{0.08}$ = 13 D	1 1
3 a	Rotate filter (in plane perpendicular to direction of light). If the intensity varies from maximum to minimum and back to maximum through 180^o, the light has been polarised.	1 1
3 b	Minimum intensity is greater than zero.	1
4 a	See Figure 4, Section 1.1.	2
4 b	Distance between source and lens is very great/infinite. Distant sources produce plane wave-fronts.	1 1
5 a	+12 D	1
5 b	0.083 m	1
6 a	In the second diagram the focal point is nearer the lens. Distance between wavefronts the same before and after the lens.	1 1
6 b	New lens power is larger as power = $\frac{1}{f}$ and *f* is smaller (or the second lens adds more curvature)	1
7	$\frac{6 \times 10^{-5}}{8 \times 10^{-14}}$ = 750 Mbyte (= 7.5 × 10^8 Byte)	1 1
8 a	0.065 V	1

8 b	10	1
8 c	6 bits (gives a resolution of 0.106 V) (7 bits gives a resolution of 0.053 V so there is some redundant information).	1 1
9 a	$\frac{\sin 45°}{\sin 26°}$ = 1.6	1 1
9 b	$\frac{3.0 \times 10^8}{1.6}$ $=1.9 \times 10^8$ m s^{-s}	1 1
9 c	angle = $\sin^{-1}(1.6 \times \sin 35°)$ = 68°	1 1
10 a	EMF = $V - Ir$ When I = zero, V = EMF	 1
10 b	Gradient giving 1.6 Ω	1 1
11 a	Any sensible suggestions, e.g.: • In gold, the structure allows electrons to travel more freely between atoms. • Gold is more dense (has more atoms per given volume), and so it has more free electrons.	2
11 b	Any sensible suggestions, e.g.: • It alters the structure to allow electrons to travel more freely. • It increases the number of free electrons.	2
12 a	$1.7(1) \times 10^8$ Pa	1
12 b	Using largest F and smallest A e.g. $\frac{148}{0.76 \times 10^{-6}}$ evaluation = 1.9×10^8 Pa	1 1
12 c	Area because this measurement has the greatest relative or % uncertainty.	1
13 a	Plastic behaviour: suffers permanent deformation from applied force. Stress: force per unit area acting at right angles to the surface.	1 1
13 b	Plastic behaviour from slipping of planes of ions/atoms. Presence of dislocations allows slippage at lower stress.	1 1
14 a	$\lambda = \frac{hc}{E}$ $= 5.3 \times 10^{-7}$ m	1 1
14 b	$\frac{40 \times 10^{-3}}{3.7 \times 10^{-19}}$ $= 1 \times 10^{17}$ photons s^{-1}	1 1
15	$\frac{4.6 \times 10^{-19}}{6.63 \times 10^{-34}}$ $= 6.9 \times 10^{14}$ Hz	1 1
16 a	Diagram: correct tip to tail and resultant.	1 1
16 b	Resultant = $(1^2 + 2^2)^{0.5}$ = 2.24	1 1
17 a	0.60 m	1
17 b	v = 360 Hz × 0.60 m = 216 m s^{-1}	1 1
17 c	See Figure 8, Section 6.1	1

18 a	$s = ut + \frac{1}{2}at^2 = 0 \times 1.6 + \frac{1}{2} \times 9.8 \times 1.6^2$ = 12.544 m = 13 m (2 s.f.)	1 1
18 b	Uncertainty = 0.1 + 0.1 = (±)0.2	1 1
18 c	(using depth from part **a**) $t = \frac{s}{v} = \frac{12.544}{340}$ = 0.037 s (2 s.f.) This will increase the estimate of the depth.	1 1
19 a	$t = \frac{2s}{u + v}$ $t = \frac{v - u}{a}$	1 1
19 b	$\frac{2s}{u + v} = \frac{v - u}{a}$ $2as = (v - u)(v + u) = v^2 - u^2$ $v^2 = u^2 + 2as$	1
20 a	$F = ma = \frac{m\Delta v}{\Delta t} = \frac{1400 \times 27}{6.2}$ = 6096.7… N = 6100 N (2 s.f.)	1 1
20 b	Diagram drawn to show: • Forwards arrow labelled driving force or similar. • Backwards arrow labelled resistive force or similar OR two backwards arrows labelled air resistance and friction or similar. • Forwards arrow is visibly larger than backwards arrow or backwards arrows combined (award zero marks if backwards arrows are visibly larger). Arrows showing normal and reaction forces to the road are not needed but should not be penalised.	1 1 1
20 c	Power = Force × velocity = 6096.7… × 72 = 4.4×10^5 J s^{-1} (2 s.f.)	1 1 1
21 a i	$\frac{14}{0.082}$ = 170 MPa or MNm^{-2} (or 1.7×10^8 Pa etc)	1 2
21 a ii	$F = 14 \times 10^6 \times 1.9 \times 10^{-7}$ = 2.7 N (2.66 N)	1 1
21 b i	Any 2 points about the sample: • Plastic behaviour. • Very large increase in strain for small increase in stress. • Gets stiffer OR larger $\Delta\sigma$ $\Delta\varepsilon$ OR larger ΔF for small Δx. • Up to ×6 original length for breaking OR ×5 at strain 4.	2
21 b ii	breaking strain ε = 5.1 $x = \varepsilon L$ = 5.1 × 15 cm = 76.5 cm	1 1 1
21 c	• Originally long chains are amorphous (crumpled, folded etc). • Monomers (or bonds) rotate or chains slip past each other/unfold. • Bonds break OR once molecules aligned bonds themselves are being stretched. Fourth mark for correct use of any one of these technical terms: Amorphous, random, monomers rotate, bonds rotate, crystalline, cross links	1 1 1 1
22 a i	$900 \times 1.6 \times 10^{-19} = 1.44 \times 10^{-16}$ J	1

22 a ii	momentum = $\sqrt{2mE} = \sqrt{2 \times 9.11 \times 10^{-31} \times 1.44 \times 10^{-16}}$ = 1.6×10^{-23} kg m s^{-1}	1 1
22 a iii	$b \sin\theta = \frac{h}{mv}$ $\sin\theta = \frac{6.6 \times 10^{-34}}{1.6 \times 10^{-23} \times 4 \times 10^{-9}}$ = 0.01… $\theta = 0.6°$	1 1 1
22 b	The first minimum will be at a smaller angle because the electrons have greater energy and therefore greater momentum so their wavelength is decreased.	1 1 1
23 a	Energy of photon = $\frac{hc}{\lambda}$ = 4.3×10^{-19} J	1 1
23 b i	$\frac{1.3 \times 10^{-3}}{1.6 \times 10^{-19}}$ = 8.125×10^{15} s^{-1}	1 1
23 b ii	Although the energy of the photons incident on the surface is greater than the work function. Some photons will interact with electrons deeper in the metal and have insufficient energy to eject a photoelectron.	1 1
23 c	Energy of red light photon = 3.3×10^{-19} J is lower than the work function of the surface	1 1