edexcel

GCE

Edexcel GCE

Physics (6734/01)

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Mark Scheme (Results)

Edexcel GCE
Physics (6734/01)

Contents

Notes on the Mark Schemes

1. *Alternative responses:* There was often more than one correct response to a particular question and these published mark schemes do not give *all* possible alternatives. They generally show only the schemes for the most common responses given by candidates. They are **not** model answers but indicate what the Examiners accepted in this examination.

2. *Error carried forward:* In general, an error made in an early part of a question is penalised there but not subsequently, i.e. candidates are penalised once only, and can gain credit in later parts of a question by correct reasoning from an earlier incorrect answer.

3. *Quantity algebra:* The working for calculations is presented using quantity algebra in the mark schemes for Units PHY1, PHY2, PHY3 (Topics), PHY4, PHY5/01, and PHY6 but candidates are not required to do this in their answers.

4. *Significant figures:* Use of an inappropriate number of significant figures in the theory papers will normally be penalised only in "show that" questions where too few significant figures has resulted in the candidate not demonstrating the validity of the given answer. Use of an inappropriate number of significant figures will normally be penalised in the practical tests. In general candidates should nevertheless be guided by the numbers of significant figures in the data provided in the question.

5. *Unit penalties:* A wrong or missing unit in the answer to a calculation will generally lose one mark unless otherwise indicated.

6. *Quality of written communication:* Each theory paper will usually have 1 or 2 marks for the quality of written communication. The mark will sometimes be a separate mark and sometimes be an option in a list of marking points.

Within the schemes:

- / indicates alternative marking point
  ( ) brackets indicate words not essential to the answer
  [ ] brackets indicate additional guidance for markers

- The following standard abbreviations are used:

a.e.	arithmetic error (−1 mark)
e.c.f.	error carried forward (allow mark(s))
s.f.	significant figures (−1 mark only where specified)
no u.e.	no unit error

6734 Unit Test PHY4

1.

(a) Units

s^{-1} / km s^{-1} kpc^{-1} /km s^{-1} Mpc^{-1} ✓ **1**

(b) Estimate

See $d = vt$ or rearrangement ✓
Substitution in $v = Hd$ for v to give $t = 1/H$ ✓
[Substitute value of H to obtain t]

Assumption

Since the Big Bang/start of time ✓
(All) galaxies/galaxy is/are travelling at constant speed / no gravitational attractive forces / Universe expands at a constant rate ✓

[H is constant scores max 1 for Assumption. Allow credit for the 4 marking points anywhere within (b)] **4**

5

2.

(a) Superposition of waves

The resultant displacement at (point where waves meet) ✓
is the (vector) addition of the individual displacements ✓ **2**
[Displacement need only be seen once]
[May be done by diagram: 1 for indication of vector; 1 for indication of scale]

(b)(i) Diagram

Lamp, single and double slit / laser and double slit (and screen) ✓
[lamp or laser must be labelled]
s about 1 mm / s given in range 0.1 mm ≤ s ≤1 mm ✓
screen at a distance of > 1 m from slits ✓ **3**

(ii)

Use of higher frequency

dots / fringe width decreases / fringes get closer together / colour of fringe moves towards blue end of spectrum ✓ **1**

(iii)

Single slit used

[marks awarded for labelled diagram, intensity graph or text]

Central brighter fringe / side fringes less bright ✓
(symmetrical) fringes on either side ✓
Central maximum ~ twice the width of side fringes ✓

[no credit for simply stating "single slit diffraction occurs"]

3

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3.

(a) Definition SHM

Acceleration / force is (directly) proportional to displacement but in ✓
opposite direction / towards equilibrium point / mean point / midpoint ✓ **2**

(b) Graph

Curve **Y** / (i) sine curve ✓
initially – ve (consequent mark) ✓

Curve **Z** / (ii) cosine curve ✓
initially – ve (consequent mark) ✓ **4**

[Both graphs drawn without labels score 0/4]

(c) Calculations

(i)

use of $T = 2\pi\sqrt{\frac{m}{k}}$ OR quote f formula ✓

Use of $f = 1/T$ use of formula ✓
$f = 2.0(1)$ (Hz) $f = 2.0(1)$ (Hz) ✓

(ii)

use of speed $= 2\pi f x_o$ ✓
$= 2\pi \times 2.01 \times 30 \times 10^{-3}$
$= 0.38$ m s^{-1} ✓ **5**

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4.

Frequency

(a)(i) $1.0(3) \times 10^{10}$ Hz ✓ **1**

Electromagnetic Spectrum

(ii) IR, microwave & radio in correct order above visible ✓
UV with either X rays / Gamma rays / both in correct order below visible ✓

(iii) Wavelength at boundary 1×10^{-8} m / 1×10^{-9} m ✓ **3**

Plane polarised

(b)(i) Vibrations/oscillations (of electric field/vector) ✓
In one direction/plane (of oscillation) ✓ **2**

Description

(ii) Diagram showing generator labelled transmitter/generator/source/emitter ✓
And suitable detector eg shows how signal is observed by using ✓
(micro)ammeter/cro/loudspeaker/computer with interface
[Ignore anything drawn between generator and detector but for each mark do not give credit if a grille etc is attached]

To detect max and min ✓
(Rotate through) 90^{o} between max and min ✓ **4**

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5.

(a) Explanation

QOWC	✓	
UV/red photon	✓	**2**
$E_{UV} > E_R$ / $f_{UV} > f_R$	✓	
$E_{UV} > \Phi$ / $f_{UV} > f_{TH}$ (so electron can break free)	✓	
One photon absorbed by one electron	✓	
Both metal plate and electron are negative or repel (each other)	✓	**max 2**

(b)(i) Intensity red light increased

nothing / no discharge	✓	

(ii) Intensity of UV increased

(Coulombmeter) discharges quicker	✓	**2**

(c) Max KE

Use of $E = hc/\lambda$	✓	
conversion of eV to J or vice versa i.e. appropriate use of 1.6×10^{-19}	✓	
Subtraction $hc/\lambda - \Phi$ [must use same units] or use of full equation	✓	
max KE = 2.2×10^{-19} J	✓	
[Candidates may convert photon energy to eV leading to max KE = 1.4 eV]		**4**
		10

6.

(a) Definition of longitudinal wave

Oscillations OR particles (of medium) move ✓

Parallel to direction of wave propagation/travel / energy transfer ✓ **2**

[2nd mark consequent on 1st]

(b) Collapsing tower

Resonance ✓

Frequency of quake = natural frequency of tower ✓

[Allow resonant frequency for natural frequency]

Max energy transfer ✓

Very large increase in amplitude of oscillation or maximum amplitude ✓ **max 3**

5

7.

(a) Radius of circular path

Correct use of $v = \frac{2\pi r}{T}$ (allow substitution of their T) ✓

Radius = 70 – 80 m (74.48 m) ✓ **2**

(b) Resultant force

$F = \frac{mv^2}{r}$ [seen or used] ✓

Force = 0.08 N (0.077 N) [Allow ecf of their radius.] ✓

Towards the centre of the circular path / towards hub. ✓ **3**

(c) Forces on the man

(i) Force P : Normal contact/reaction force / EM force / push of capsule or floor on man ✓

Force Q : Pull of Earth on man / weight / gravitational pull ✓ **2**

(ii) Resultant force (to centre) ✓

(at A provided by) friction ✓ **2**

(iii) at B resultant provided (by force Q being greater than P) ✓ **1**

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