U6 Week1 MCQ

All working must be shown in full on the M.A.T

Name: _____

Class: _____

Date: _____

Time:	**30minutes**
Marks:	**30 marks**
Comments:	**1 mark correct for workings, 1 mark correct answer. Do not write on and submit this paper. USE THE MCQ Answer Template on GoL**

1 $^{236}_{92}U$ undergoes a series of decays to produce $^{204}_{82}Pb$.

How many alpha decays are involved in this decay series?

A 5 ⬭

B 6 ⬭

C 8 ⬭

D 10 ⬭

(Total 1 mark)

2 Which row links both the photoelectric effect and electron diffraction to the properties of waves and particles?

	Photoelectric effect	**Electron diffraction**	
A	Particle property	Particle property	⬭
B	Wave property	Wave property	⬭
C	Particle property	Wave property	⬭
D	Wave property	Particle property	⬭

(Total 1 mark)

3 An iodine nucleus decays into a nucleus of Xe−131, a beta-minus particle and particle Y.

$$^{131}_{53}\mathrm{I} \rightarrow {}^{131}_{54}\mathrm{Xe} + {}^{0}_{-1}\mathrm{e} + \mathrm{Y}$$

Which is a property of particle Y?

A It has a lepton number of +1 ⬭

B It is an antiparticle ⬭

C It is negatively charged ⬭

D It experiences the strong interaction ⬭

(Total 1 mark)

4 Immediately after take-off from the surface of the Earth, a rocket of mass 12 000 kg accelerates vertically upwards at 1.4 m s^{-2}

What is the thrust produced by the rocket motor?

A 1.7×10^4 N ⬭

B 1.0×10^5 N ⬭

C 1.3×10^5 N ⬭

D 1.6×10^5 N ⬭

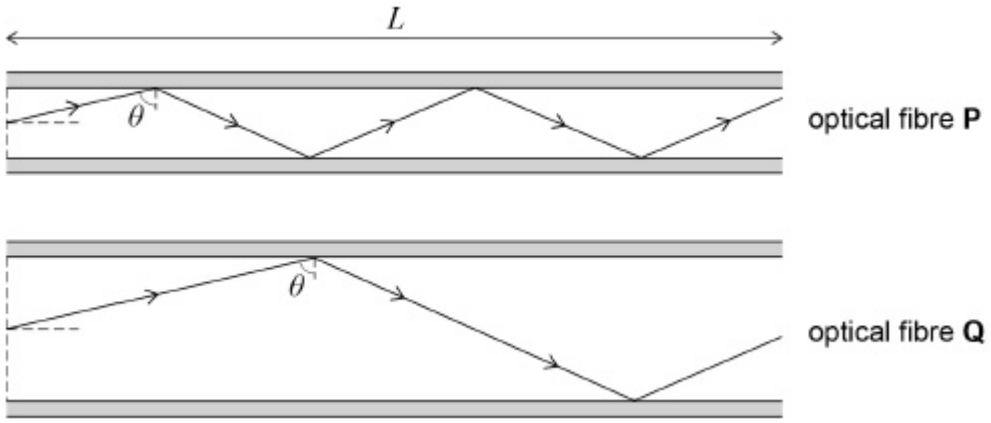
(Total 1 mark)

5 Rays of light are incident at the same angle θ on the core–cladding boundary of optical fibres **P** and **Q**.

The cores of **P** and **Q** have the same refractive index n.

P and **Q** are the same length L.

The core diameter of **P** is half that of **Q**.



The time for the ray to travel along optical fibre **P** is

$$\frac{nL}{c\sin\theta}$$

where c is the speed of light in a vacuum.

What is the time for the ray to travel along optical fibre **Q**?

A $\frac{nL}{c\sin\theta}$ ⬭

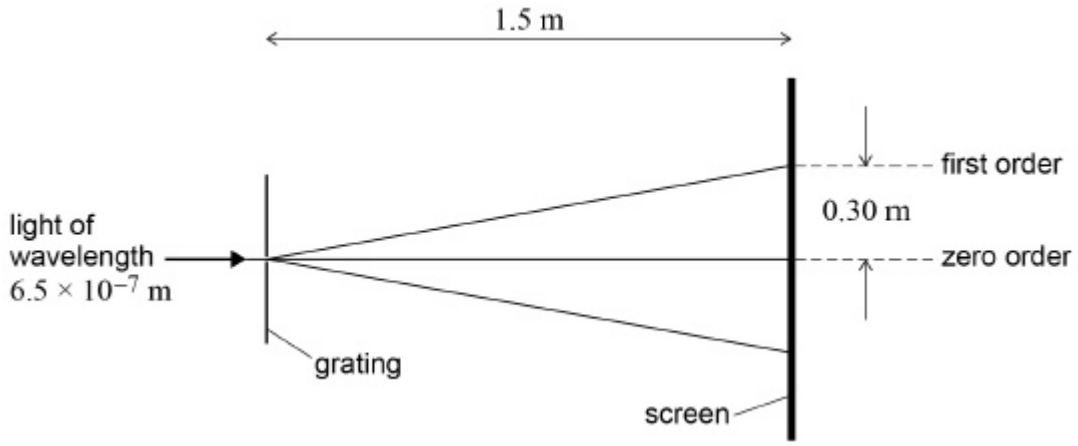
B $\frac{nL}{2c\sin\theta}$ ⬭

C $\frac{2nL}{c\sin\theta}$ ⬭

D $\frac{4nL}{c\sin\theta}$ ⬭

(Total 1 mark)

6 A diffraction grating is illuminated normally with light of wavelength 6.5×10^{-7} m
When a screen is 1.5 m from the grating, the distance between the zero and first-order maxima on the screen is 0.30 m



What is the number of lines per mm of the diffraction grating?

A 3.3×10^{-6} ⬭

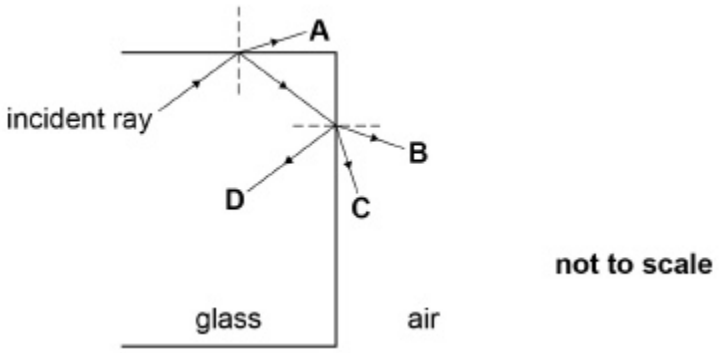
B 3.3×10^{-3} ⬭

C 3.0×10^{2} ⬭

D 3.0×10^{5} ⬭

(Total 1 mark)

7 A ray of light is incident on a glass–air boundary of a rectangular block as shown.



The refractive index of this glass is 1.5
The refractive index of air is 1.0
The angle of incidence of the light at the first glass–air boundary is 44°

What is the path of the ray of light?

A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

8 A girl is bouncing on a trampoline.

Assuming that air resistance is negligible, her acceleration

A is zero when she is at maximum height. ⬭

B is constant when she is in the air. ⬭

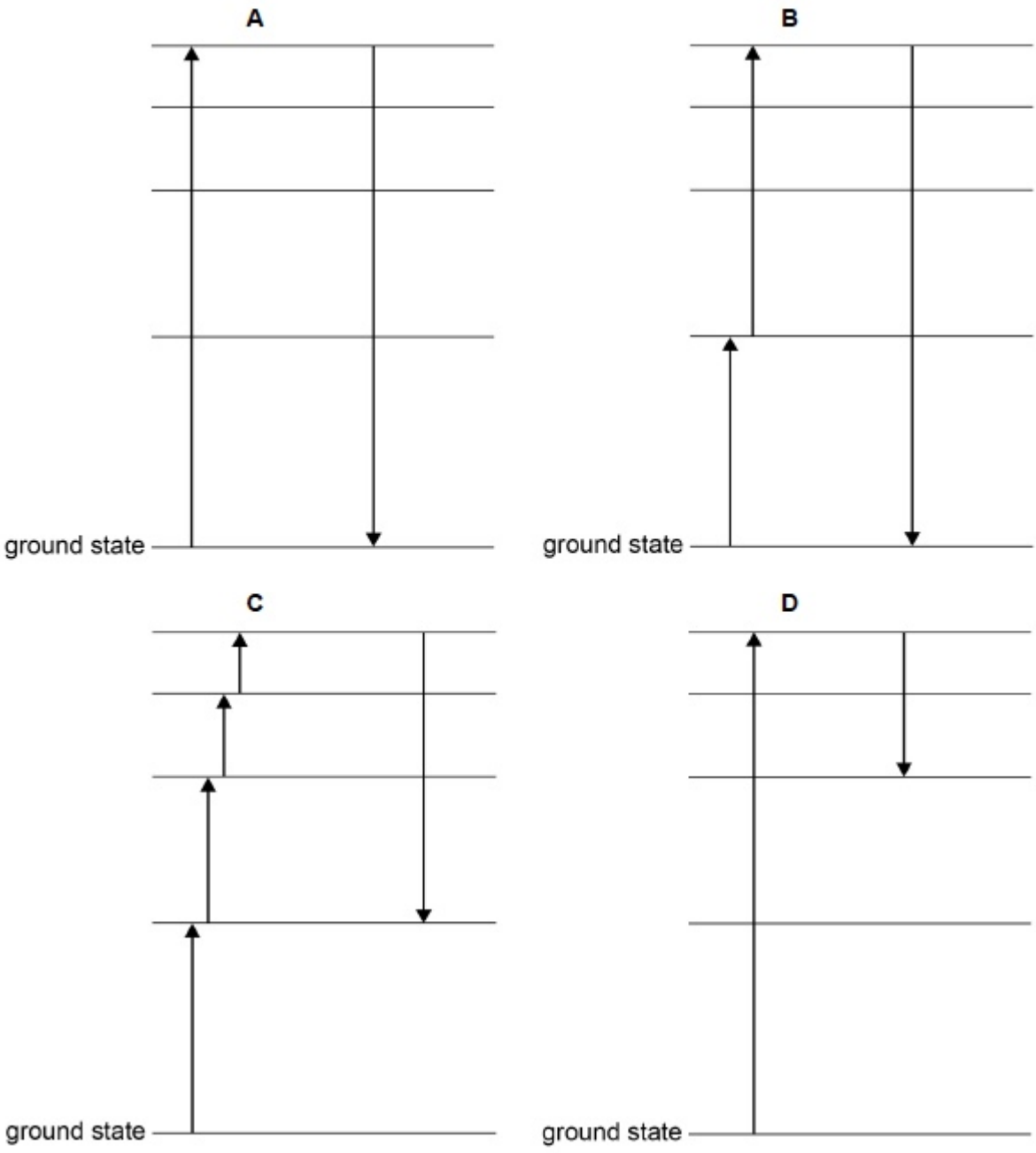
C changes direction as she rises and then falls. ⬭

D is maximum just before she lands on the trampoline. ⬭

(Total 1 mark)

9 An atom in the inner coating of a fluorescent tube absorbs a photon of ultraviolet radiation. This causes excitation of the atom from its ground state. A photon of visible light is then emitted.

Which energy level diagram represents this process?



A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

10 Objects **P** and **Q** are initially at rest at time $t = 0$

The same resultant force F is applied to **P** and **Q** for time T.

The mass of **P** is 10 times greater than the mass of **Q**.

What is the ratio $\frac{\text{kinetic energy of } \mathbf{P}}{\text{kinetic energy of } \mathbf{Q}}$?

A 0.1 ⬭

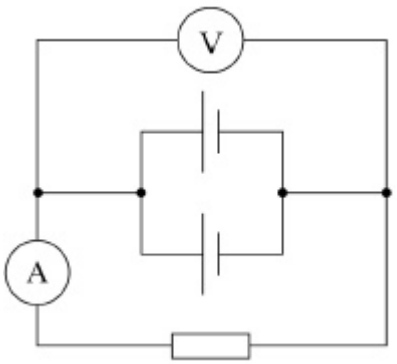
B 1 ⬭

C 10 ⬭

D 100 ⬭

(Total 1 mark)

11 A circuit consists of two identical cells, a resistor, an ammeter and a voltmeter. The cells each have an emf of 3.0 V and the resistor has a resistance of 12 Ω
The cells have negligible internal resistance.



Which row shows the readings on the voltmeter and ammeter?

	Voltage / V	Current / A	
A	3.0	0.25	⬭
B	3.0	0.50	⬭
C	6.0	0.25	⬭
D	6.0	0.50	⬭

(Total 1 mark)

12 Fluoride ions are produced by the addition of a single electron to an atom of fluorine $^{19}_{9}F$.

What is the magnitude of specific charge of the fluoride ion?

A 3.2×10^{-26} C kg^{-1} ⬭

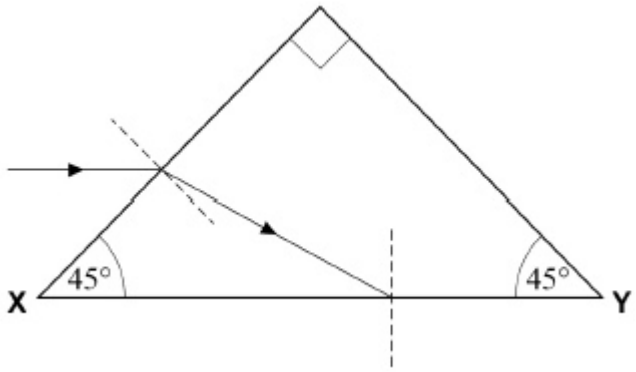
B 8.4×10^{-21} C kg^{-1} ⬭

C 5.0×10^{6} C kg^{-1} ⬭

D 4.5×10^{7} C kg^{-1} ⬭

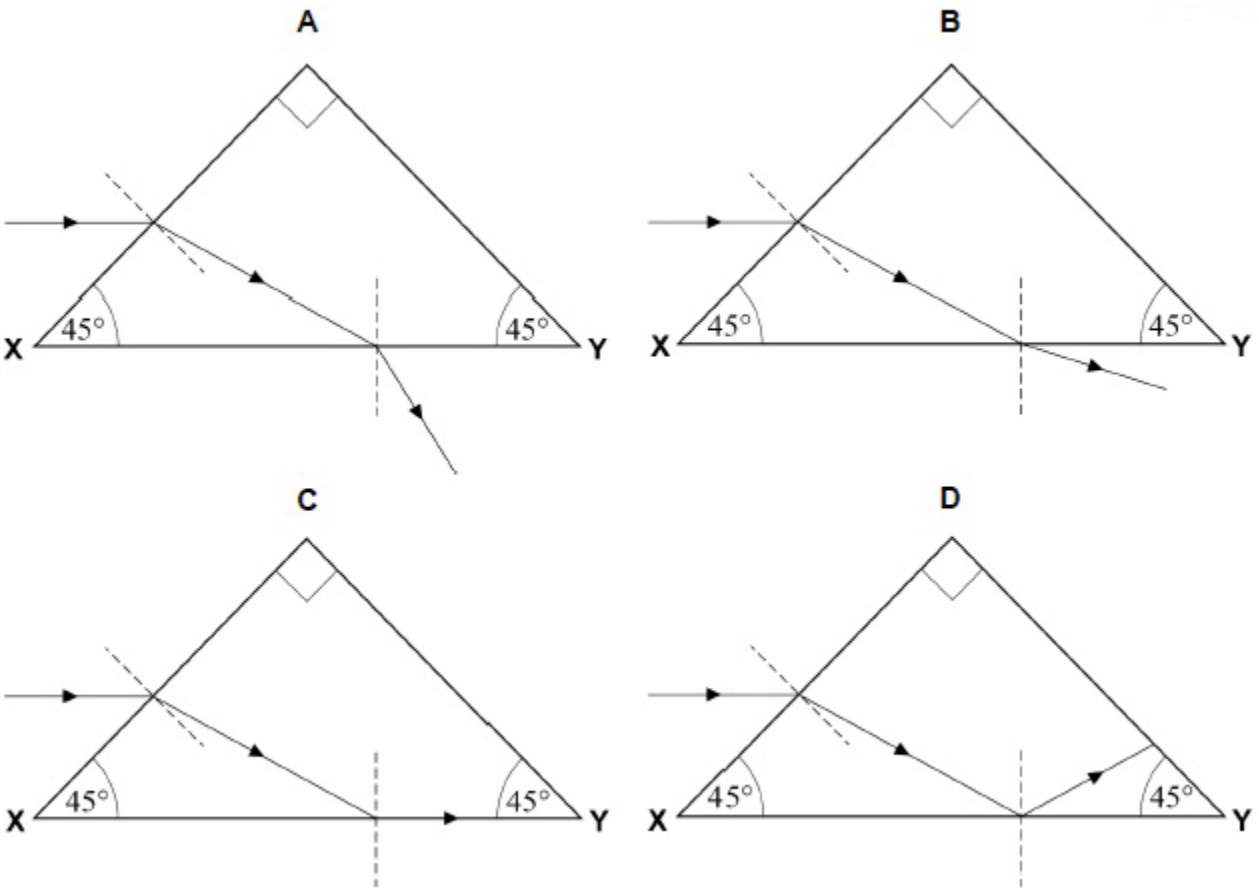
(Total 1 mark)

13 The diagram shows part of the path of a ray of light through a right-angled prism.



The prism is made of glass of refractive index 1.5
The incident light ray is parallel to the face **XY**. The ray is refracted towards the face **XY**.

What is the path of the ray after it is incident on face **XY**?



A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

14 A steel wire **W** has a length l and a circular cross-section of radius r. When **W** hangs vertically and a load is attached to the bottom end, it extends by e.
Another wire **X** made from the same material has the same load attached to it.

Which length and radius for **X** will produce an extension of $\frac{e}{4}$?

	Length of X	Radius of X	
A	$0.5l$	$2r$	⬭
B	l	$4r$	⬭
C	$2l$	$2r$	⬭
D	$4l$	$4r$	⬭

(Total 1 mark)

15 Photons of wavelength 290 nm are incident on a metal plate. The work function of the metal is 4.1 eV

What is the maximum kinetic energy of the emitted electrons?

A 0.19 eV ⬭

B 4.3 eV ⬭

C 6.9 eV ⬭

D 8.4 eV ⬭

(Total 1 mark)