

# The Photoelectric Effect

## TOPIC QUESTIONS

<b>Level</b>	<b>AS Level</b>
<b>Subject</b>	<b>Physics</b>
<b>Exam Board</b>	<b>AQA</b>
<b>Paper Type</b>	<b>Multiple Choice</b>

Time Allowed : 30min

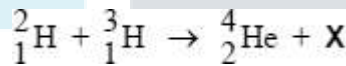
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1. Which decay of a positive kaon ( $K^+$ ) particle is possible?

- A  $K^+ \rightarrow \pi^0 + e^+ + \bar{\nu}_e$
- B  $K^+ \rightarrow p + \nu_\mu$
- C  $K^+ \rightarrow \pi^+ + \pi^+ + \pi^0$
- D  $K^+ \rightarrow \mu^+ + \nu_\mu$

2. A deuterium nucleus and a tritium nucleus fuse together to produce a helium nucleus and particle

X.



What is X?

- A an electron
- B a neutron
- C a positron
- D a proton

3. Which row gives a particle with its quark combination and category?

	Particle	Quark combination	Category
A	Negative pion	$d\bar{u}$	baryon
B	Positive pion	$u\bar{d}$	hadron
C	Negative pion	$u\bar{d}$	meson
D	Positive pion	$d\bar{u}$	hadron

4. Which row gives the numbers of baryons and leptons in an atom of ?

	Number of baryons	Number of leptons
A	6	6
B	12	6
C	6	12
D	18	0

5. A muon

**A** is subject to the strong interaction.

**B** can decay into an electron only.

**C** is a stable particle.

**D** is subject to the weak interaction.

6. Young's two slit interference pattern with red light of wavelength  $7.0 \times 10^{-7}$  m gives a fringe separation of 2.0 mm.

What separation, in mm, would be observed at the same place using blue light of wavelength  $45 \times 10^{-7}$  m?

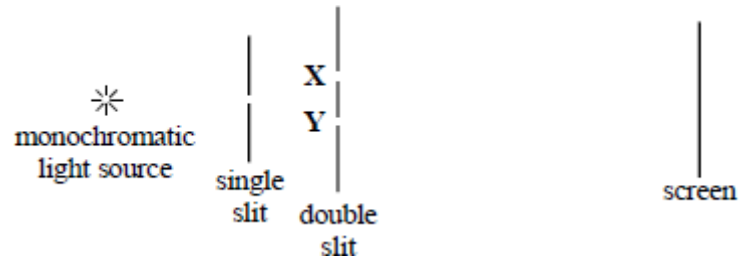
**A** 0.65

**B** 1.3

**C** 2.6

**D** 3.1

7. The diagram represents the experimental arrangement used to produce interference fringes in Young's double slit experiment.



The spacing of the fringes on the screen will increase if

- A the width of the single slit is increased
- B the distance XY between the two slits is increased
- C a light source of lower frequency is used
- D the distance between the single and double slits is decreased

8. Electrons and protons in two beams are travelling at the same speed. The beams are diffracted by objects of the same size.

Which correctly compares the de Broglie wavelength  $\lambda_e$  of the electrons with the de Broglie wavelength  $\lambda_p$  of the protons and the width of the diffraction patterns that are produced by these beams?

	comparison of deBroglie wavelength	diffraction pattern	
A	$\lambda_e > \lambda_p$	electron beam width > proton beam width	
B	$\lambda_e < \lambda_p$	electron beam width > proton beam width	
C	$\lambda_e > \lambda_p$	electron beam width < proton beam width	
D	$\lambda_e < \lambda_p$	electron beam width < proton beam width	

9. The intensity of a monochromatic light source is increased. Which of the following is
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correct?

	Energy of an emitted photon	Number of photons emitted per second	
A	increases	increases	
B	increases	unchanged	
C	unchanged	increases	
D	unchanged	unchanged	

10. A diffraction pattern is formed by passing monochromatic light through a single slit. If the width of the single slit is reduced, which of the following is true?

	Width of central maximum	Intensity of central maximum	
A	unchanged	decreases	
B	increases	increases	
C	increases	decreases	
D	decreases	decreases	

11. When comparing X-rays with UV radiation, which statement is correct?

- A X-rays have a lower frequency.
- B X-rays travel faster in a vacuum.
- C X-rays do not show diffraction and interference effects.
- D Using the same element, photoelectrons emitted using X-rays have the greater maximum kinetic energy

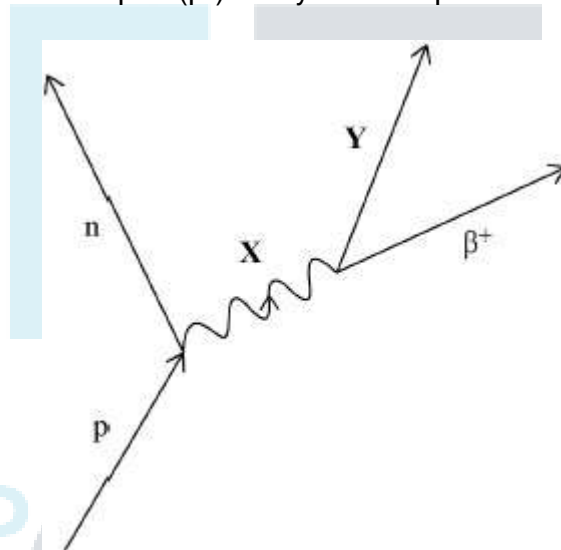
12. Monochromatic radiation from a source of light (source A) is shone on to a

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metallic surface and electrons are emitted from the surface. When a second source (source B) is used no electrons are emitted from the metallic surface. Which property of the radiation from source A must be greater than that from source B?

- A amplitude
- B frequency
- C intensity
- D wavelength

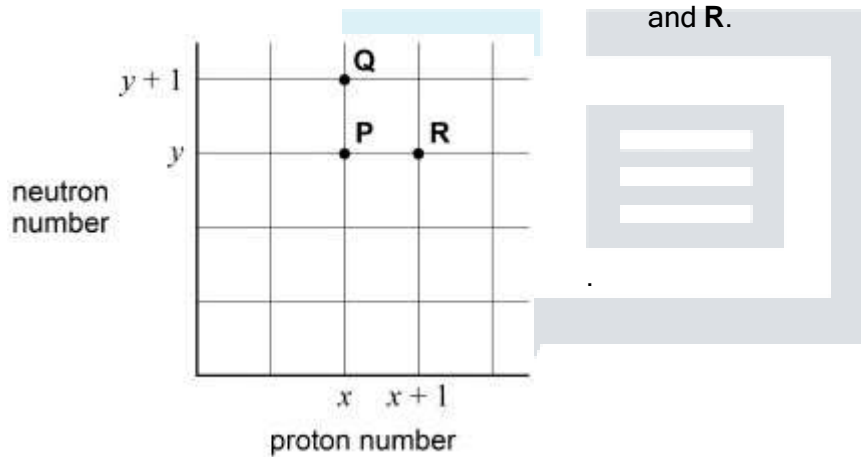
13. The process of beta plus ( $\beta^+$ ) decay can be represented by



Which row identifies particles X and Y?

	X	Y
A	$W^+$	$\nu_e$
B	$W^+$	$\bar{\nu}_e$
C	$W^-$	$\nu_e$
D	$W^-$	$\bar{\nu}_e$

14. The graph of neutron number against proton number shows three nuclei **P**, **Q** and **R**.



Which row identifies an isotope of **P** and the nucleon number of this isotope of **P**?

	Isotope of <b>P</b>	Nucleon number of isotope of <b>P</b>	
<b>A</b>	<b>Q</b>	$y + 1$	
<b>B</b>	<b>Q</b>	$x + y + 1$	
<b>C</b>	<b>R</b>	$x + y + 1$	
<b>D</b>	<b>R</b>	$x + 1$	

15.  ${}_{92}^{236}\text{U}$  undergoes a series of decays to produce  ${}_{82}^{204}\text{Pb}$ . How many alpha decays are involved in this decay series?

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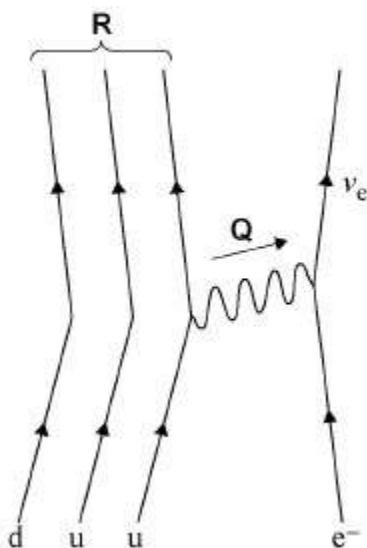
- A 5
- B 6
- C 8
- D 10



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16. The partially completed diagram represents electron capture.



Which row identifies the exchange particle **Q** and the quark structure of particle **R**?

	Particle <b>Q</b>	Quark structure of particle <b>R</b>
<b>A</b>	$W^-$	uuu
<b>B</b>	$W^+$	dud
<b>C</b>	$W^+$	uuu
<b>D</b>	$W^-$	dud

17. Fluoride ions are produced by the addition of a single electron to an atom of fluorine  ${}^{19}_{9}\text{F}$ . What is the magnitude of specific charge of the fluoride ion?

- A**  $3.2 \times 10^{-26} \text{ C kg}^{-1}$
- B**  $8.4 \times 10^{-21} \text{ C kg}^{-1}$
- C**  $5.0 \times 10^6 \text{ C kg}^{-1}$

D  $4.5 \times 10^7 \text{ C kg}^{-1}$

18. In a photoelectric experiment, light is incident on the metal surface of a photocell. Increasing the intensity of the illumination at the surface leads to an increase in the

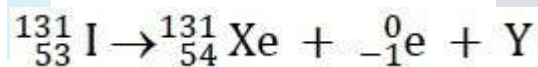
A work function

B minimum frequency at which electrons are emitted

C current through the photocell

D speed of the electrons

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

20. Which row shows the correct interactions experienced by a hadron or a lepton?

	<b>Particle</b>	<b>Strong interaction</b>	<b>Weak interaction</b>	
<b>A</b>	Hadron	Yes	Yes	
<b>B</b>	Lepton	Yes	Yes	
<b>C</b>	Hadron	Yes	No	
<b>D</b>	Lepton	Yes	No	



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