

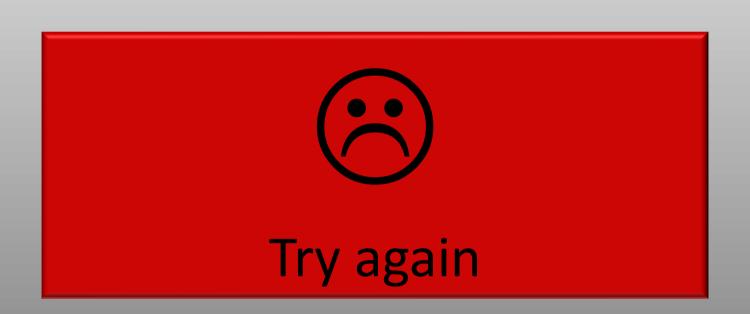
1. Fundamental subatomic particles can be divided into two groups:

Hadrons & mesons

Mesons & baryons

Baryons & leptons

Leptons & hadrons





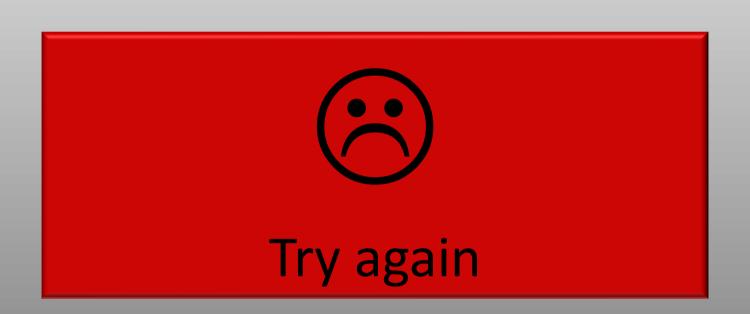
## 2. Leptons include:

Electrons, muons, neutrinos

Electrons, quarks, mesons

Neutrinos, protons, pions

Muons, neutrinos, mesons



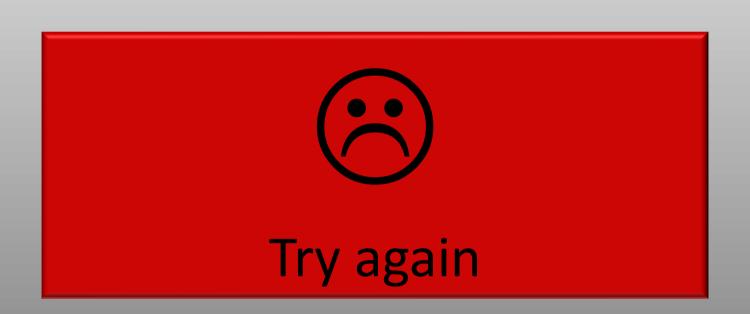


3. Which of these is **not** a baryon?

Proton

Neutron

Kaon





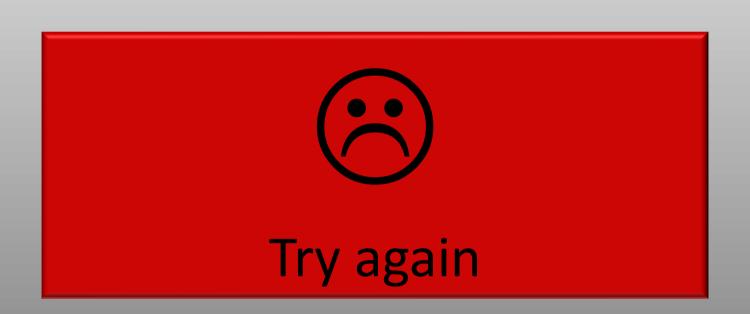
4. Up, down, strange charm are all types of:

Lepton

Quark

Neutrino

Boson





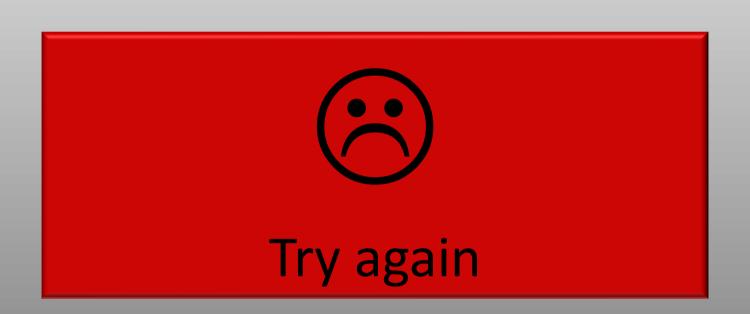
5. The electromagnetic force is carried by:

W bosons

Z bosons

Virtual photons

Gluons





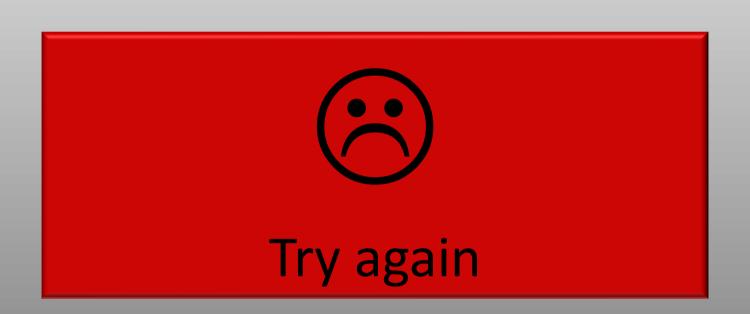
6. The weak nuclear force is carried by:

W bosons

Higgs bosons

Virtual photons

Gravitons



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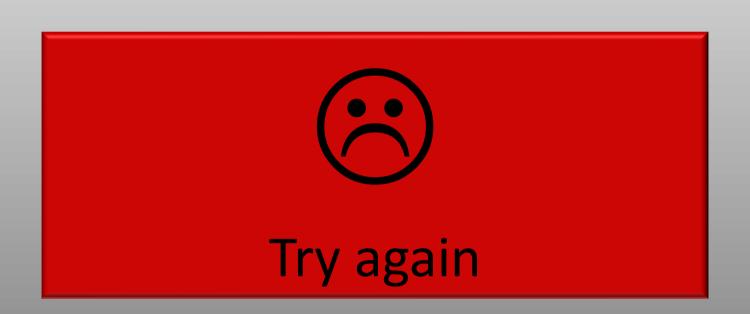
7. In  $\beta$ - decay,

$$n \rightarrow p + e^- + v$$

 $n \rightarrow p + e^+ + antineutrino$ 

$$n \rightarrow p + e^+ + v$$

 $n \rightarrow p + e^{-} + antineutrino$ 



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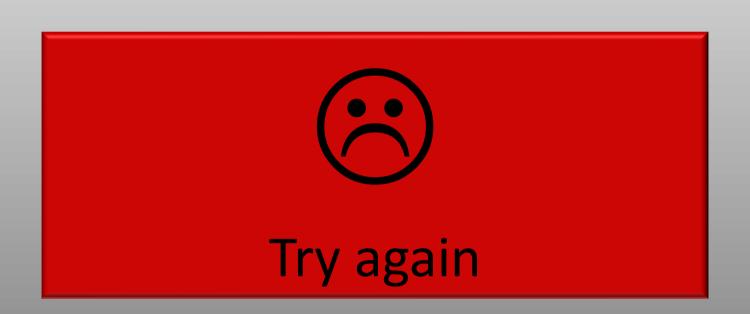
## 8. The charges on up & down quarks are:

$$u = -2/3$$
  $d = +1/3$ 

$$u = +2/3$$
  $d = -1/3$ 

$$u = -1/3$$
  $d = +2/3$ 

$$u = +1/3$$
  $d = +2/3$ 





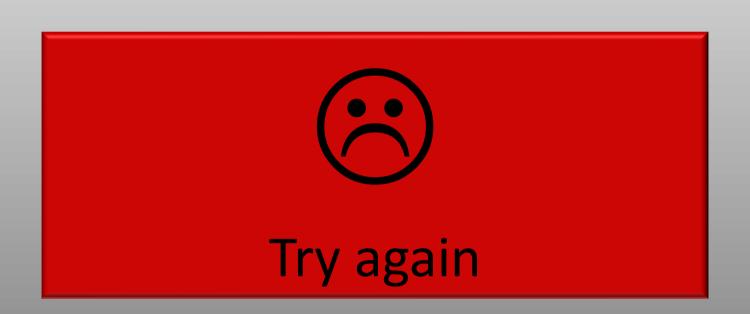
9. Which of these are conserved in all interactions?

Charge, strangeness, baryon number

Baryon number, strangeness, lepton number

Strangeness, lepton number, baryon number

Lepton number, baryon number, charge





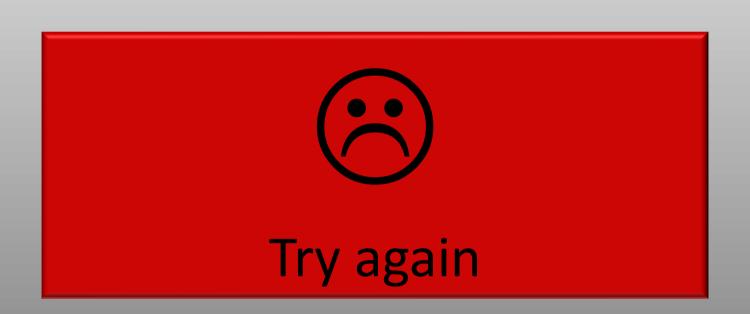
10. Wave-particle duality: which of these demonstrates the wavelike nature of light?

Reflection

Diffraction

Refraction

Momentum of photons





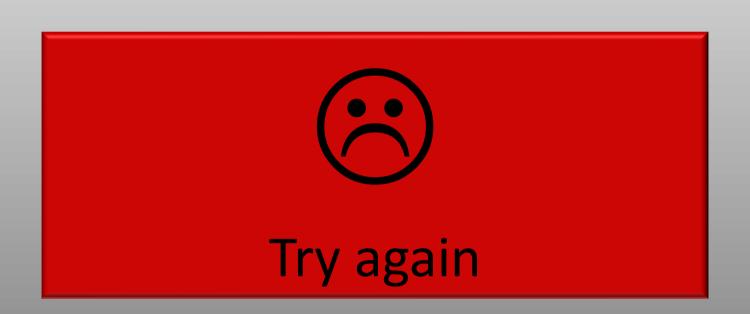
11. Which of these is a correct version of the de Broglie equation for wave-particle duality?

$$\lambda = h/p$$

$$f = h/p$$

$$h = \lambda/p$$

$$h = f/p$$





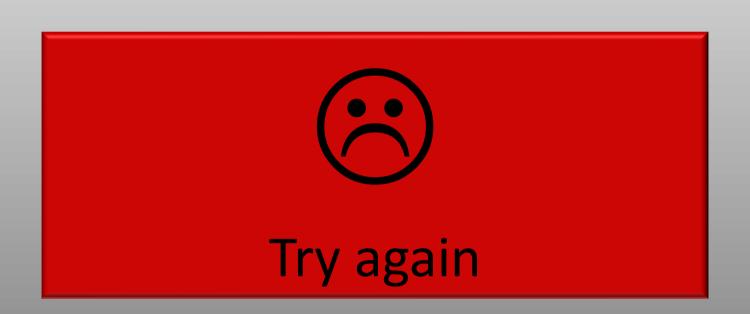
12. The photoelectric effect shows that we can consider light as being

a wave

particles

electromagnetic radiation

charged particles





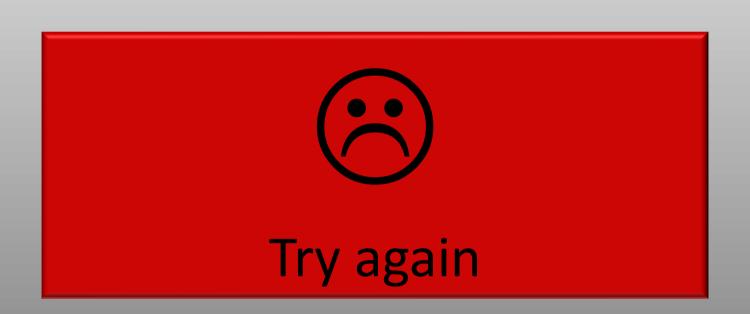
13. The work function of a material is the energy needed to

ionise its atoms.

cause the electrons to emit a line spectrum.

equal the energy of an incoming photon.

cause an electron to escape from the material.



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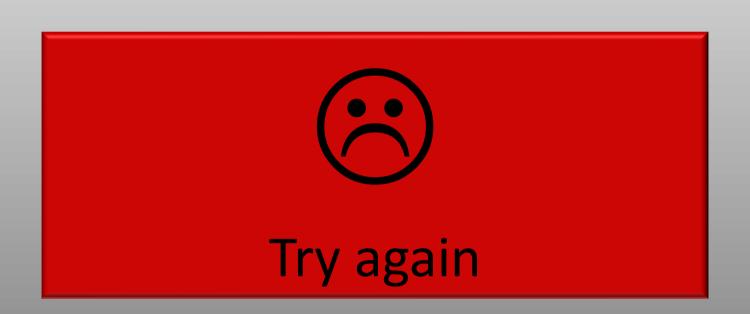
## 14. A proton has

baryon number = 1 lepton number = 0

baryon number = 1, lepton number = 1

baryon number = 0 lepton number = 1

baryon number = 0 lepton number = 0



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15. What is the correct quark configuration for a proton and a neutron?

$$p = udd \quad n = udd$$

$$p = udd \quad n = uud$$

$$p = uud \quad n = uud$$

$$p = uud \quad n = udd$$

