**Comprehensive Exam Study Guide**

**B.Ed. in Secondary Education –**

**Science concentration/Physics**

**Introduction**

The College of Education administers a comprehensive exam to all students that they must pass with a score of 80% or better to be approved to enter student teaching/internship to ensure that students have the content, pedagogical, and professional knowledge needed to be successful in student teaching and in entering the teaching career.

Students take the exam just prior to student teaching/internship, and will not be allowed to register for student teaching/internship unless a passing score (> 80 %) has been obtained. Students will have two opportunities to pass the test.

The test is administered on Blackboard and students can get immediate feedback on their performance in the test.

In the following section, the guide offers a specification of the topics covered in the exam questions, the Qatar curriculum standards the questions are related to and sample questions for each concentration.

The exam consists of 60 multiple-choice questions. They are aligned to, and categorized by the Qatari curriculum standards for intermediate and secondary school levels. The curriculum standards covered in the exam are the following:

|  |  |  |
| --- | --- | --- |
| **Part I: Alignment between Comp. Exam’s questions & Physics Curriculum Content Standards for the State of Qatar** | | |
| **Question No.** | **Standards #** | **Physics Content** |
|  | 10 A-26.2 | Derive, from the definitions of velocity and acceleration, equations that  represent uniformly accelerated motion in a straight line and use them to  solve problems relating to the motion of objects under uniform acceleration. |
|  | 10 A-26.1 | Understand the concepts of displacement, speed, velocity and acceleration, represent them graphically and interpret graphs that represent them. |
|  | 10 A-25.2 | Distinguish between precision and accuracy; know how to ensure both in physical procedures. |
|  | 10 A-26.2 | Derive, from the definitions of velocity and acceleration, equations that  represent uniformly accelerated motion in a straight line and use them to  solve problems relating to the motion of objects under uniform acceleration. |
|  | 10 A-26.1 | Understand the concepts of displacement, speed, velocity and acceleration, represent them graphically and interpret graphs that represent them. |
|  | 10- 3.3  10-1.2 | 10 A – 3.3: Draw valid conclusions, allowing for errors and uncertainties.  10 A – 1.2: make predictions directly related to a research question |
|  | 10- 25.2 | Distinguish between precision and accuracy; know how to ensure both in physical procedures. |
|  | 10- 3.3  10-1.2 | Draw valid conclusions, allowing for errors and uncertainties. |
|  | 10 A-26.2 | Derive, from the definitions of velocity and acceleration, equations that  represent uniformly accelerated motion in a straight line and use them to  solve problems relating to the motion of objects under uniform acceleration. |
|  | 10 A-26.2 | Derive, from the definitions of velocity and acceleration, equations that  represent uniformly accelerated motion in a straight line and use them to  solve problems relating to the motion of objects under uniform acceleration. |
|  | 10-1.2  10-26.1 | Understand the concepts of displacement, speed, velocity and acceleration, represent them graphically and interpret graphs that represent them. |
|  | 10 A-26.4 | Identify forces acting on a body, determine resultants, resolve forces into  components and use the vector triangle to represent forces in equilibrium. |
|  | 10 A-26.4 | Identify forces acting on a body, determine resultants, resolve forces into  components and use the vector triangle to represent forces in equilibrium. |
|  | 10A-26.3  10A-26.4 | Know that a force acting on an object can cause deformation or velocity  change.  Identify forces acting on a body, determine resultants, resolve forces into  components and use the vector triangle to represent forces in equilibrium. |
|  | 10 A-26.4 | Identify forces acting on a body, determine resultants, resolve forces into  components and use the vector triangle to represent forces in equilibrium |
|  | 10-26.4  11- 26.2 | Identify forces acting on a body, determine resultants, resolve forces into  components and use the vector triangle to represent forces in equilibrium  Know that linear momentum is the product of mass and velocity, and that a momentum change on a body is equal to the force causing it. Understand and use the relationship *F = ma*. |
|  | 10-26.4  11A- 26.2 | Identify forces acting on a body, determine resultants, resolve forces into  components and use the vector triangle to represent forces in equilibrium.  Know that linear momentum is the product of mass and velocity, and that a momentum change on a body is equal to the force causing it. Understand and use the relationship *F = ma*. |
|  | 10-1.3  10-1.8  10-3.2  10-3.3 | 10 – 1.3: Identify and control variables  .  10- 1.8: Identify, and make critical use of, secondary information.  10 – 3.2: Process raw data by the most appropriate means.  10 – 3.3 :Draw valid conclusions, allowing for errors and uncertainties. |
|  | 10 A-26.4  11A -26.2 | 10 A- 26.4: Identify forces acting on a body, determine resultants, resolve forces into components and use the vector triangle to represent forces in equilibrium.  11A- 26.2: Know that linear momentum is the product of mass and velocity, and that a momentum change on a body is equal to the force causing it. Understand and use the relationship *F = ma*. |
|  | 12A- 25.3  10-26.4 | Identify forces acting on a body, determine resultants, resolve forces into  components and use the vector triangle to represent forces in equilibrium.  10- 26.4 A: Identify forces acting on a body, determine resultants, resolve forces into components and use the vector triangle to represent forces in equilibrium. |
|  | 12-25.5 A? | Relate gravitational force to the centripetal acceleration it causes, with  particular reference to Earth satellite orbits, and show an understanding of the applications of geostationary orbits. |
|  | 12-25.5 A? | Relate gravitational force to the centripetal acceleration it causes, with  particular reference to Earth satellite orbits, and show an understanding of the applications of geostationary orbits. |
|  | 12-25.1 A? | Express angular displacement in radians and describe, qualitatively and  quantitatively, motion in a circular path due to a perpendicular force  causing a centripetal acceleration. |
|  | 12-25.2 A? | 25.2 Understand and use the concept of angular velocity to solve problems in various situations using the formulae v = rω, a = rω2 and a = v2/r. |
|  | 10-26.5 | 10A – 26.5: Show a qualitative knowledge of frictional forces and viscous forces including air and water resistance and distinguish between static and  dynamic friction. |
|  | 11A-27.3 | Recall, derive and apply the formulae *ek = 1/2mv^2*and *E*p *= mgh*. |
|  | 11A-27.3 | Recall, derive and apply the formulae *ek = 1/2mv^2*and *E*p *= mgh*. |
|  | 11A-27.3 | Recall, derive and apply the formulae *ek = 1/2mv^2*and *E*p *= mgh*. |
|  | 11A-27.3 |  |
|  | 11A-27.2  11A-27.3 | Define kinetic and potential energy.  Recall, derive and apply the formulae *ek = 1/2mv^2* and *E*p *= mgh*. |
|  | 11A-27.3 | Recall, derive and apply the formulae *ek = 1/2mv^2*and *E*p *= mgh*. |
|  | 11A-27.3 | Recall, derive and apply the formulae *ek = 1/2mv^2*and *E*p *= mgh*. |
|  | 11A-27.2  11A-27.3 | Define kinetic and potential energy.  Recall, derive and apply the formulae *ek = 1/2mv^2* and *E*p *= mgh*. |
|  | 11A-27.3 | Recall, derive and apply the formulae *ek = 1/2mv^2*and *E*p *= mgh*. |
|  | 11A-27.2  11A-27.3 | Define kinetic and potential energy.  Recall, derive and apply the formulae *ek = 1/2mv^2*and *E*p *= mgh*. |
|  | 11A-27.2  11A-27.3 | Define kinetic and potential energy.  Recall, derive and apply the formulae *ek = 1/2mv^2*and *E*p *= mgh*. |
|  | 11A-26.5 | Know the principle of conservation of momentum and apply it to elastic  and inelastic collisions and explosions involving two bodies |
|  | 11A-26.5 | Know the principle of conservation of momentum and apply it to elastic  and inelastic collisions and explosions involving two bodies |
|  | 11A-26.5 | Know the principle of conservation of momentum and apply it to elastic  and inelastic collisions and explosions involving two bodies |
|  | 11A-26.5 | Know the principle of conservation of momentum and apply it to elastic  and inelastic collisions and explosions involving two bodies |
|  | 11A-26.5 | Know the principle of conservation of momentum and apply it to elastic  and inelastic collisions and explosions involving two bodies |
|  | 11A-27.2  11A-27.4 | Define kinetic and potential energy  Calculate conversion efficiencies relating energy input to useful  energy output |
|  | 11A-27.4 | Calculate conversion efficiencies relating energy input to useful  energy output |
|  | 11A-27.2  11A-27.4 | Define kinetic and potential energy  Calculate conversion efficiencies relating energy input to useful  energy output |
|  | 12A-26.5 | Apply the kinetic particle model to an ideal gas and explain, in terms of  molecular size and intermolecular forces, how the behaviour of real gases  deviates from the ideal model at high pressures and low temperatures. |
|  | 12A-26.5 | Apply the kinetic particle model to an ideal gas and explain, in terms of  molecular size and intermolecular forces, how the behaviour of real gases  deviates from the ideal model at high pressures and low temperatures. |
|  | 7- 11.3 | Explain, in terms of the particle model, a variety of common phenomena,  such as thermal expansion, gas pressure, the compressibility of gases (but  not liquids and solids) and the regular growth of crystals in a saturated  solution. |
|  | 10A-27.2 | Use the kinetic particle model to explain fluid pressure, freezing, melting, boiling, evaporation, crystallisation and the Brownian motion. |
|  | 10A-27.2 | Use the kinetic particle model to explain fluid pressure, freezing, melting, boiling, evaporation, crystallisation and the Brownian motion. |
|  | 9-20.8 | Know how, in terms of the movement of particles, sound is transmitted through a medium and how the ear detects sounds. |
|  | 9-20.9 | Know that pitch is determined by the frequency of a sound and that  amplitude is a measure of the loudness and is measured in decibels, which is a logarithmic scale. |
|  | 10A-28.7  10A-28.8  10A-28.5 | 10 A- 28.7: Distinguish between standing waves and progressive waves in terms of the production of sound by a musical instrument. Know how harmonics are produced and how the frequency and sound of the harmonics relate to the fundamental.  10 A – 28.8 Distinguish between a standing and a travelling wave, know the meaning of the terms *node* and *antinode*, and illustrate the phenomenon of resonance with particular reference to vibrating stretched strings and air columns.  10A – 28.5: Know that the velocity of sound depends on the medium though which it travels, and that it travels faster and more efficiently through media in which the particles are close together. |
|  | 10A-28.3 | Know and use the terms *crest*, *trough*, *compression*, *rarefaction*,  *displacement*, *amplitude*, *phase difference*, *period*, *frequency*, *wavelength*  and *velocity*, and perform calculations using the relationships between  velocity, frequency and wavelength. |
|  | 10A-28.4 | Know that sound is a longitudinal vibration transmitted through a medium, and that it is created by a vibrating object such as a vibrating string or air column. |
|  | 10A-28.4 | Know that sound is a longitudinal vibration transmitted through a medium, and that it is created by a vibrating object such as a vibrating string or air column. |
|  | 11A-29.6 | Explain electromagnetic radiation in terms of oscillating electric and  magnetic fields and know that all electromagnetic waves travel with the  same velocity in free space. Describe the main characteristics and  applications of the different parts of the electromagnetic spectrum and give examples of the reflection, refraction and interference of electromagnetic waves. |
|  | 11A-29.6 | Explain electromagnetic radiation in terms of oscillating electric and  magnetic fields and know that all electromagnetic waves travel with the  same velocity in free space. Describe the main characteristics and  applications of the different parts of the electromagnetic spectrum and give examples of the reflection, refraction and interference of electromagnetic waves. |
|  | 9-20.5 | Explain the refraction of light and water waves in terms of the change in  velocity of waves. |
|  | 9-21.6  10A-31.3 | 9- 21.6: Calculate the resistance of a component knowing the current passing through it and the potential difference between its ends.  10A-31.3: Define resistance and solve problems using the relationships *V = IR* and *R =* ρ*l/A* for multiple resistances connected in series and in parallel*.* |
|  | 9-21.6  10A-31.3 | 9- 21.6: Calculate the resistance of a component knowing the current passing through it and the potential difference between its ends.  10A-31.3: Define resistance and solve problems using the relationships *V = IR* and *R =* ρ*l/A* for multiple resistances connected in series and in parallel*.* |
|  | 9-21.6  10A-31.1 | 9- 21.6: Calculate the resistance of a component knowing the current passing through it and the potential difference between its ends.  10A-31.1: Know that electric current is the rate of flow of charged particles, define  charge and the coulomb, and solve problems using the relationship *Q = It.* |
|  | 11A- 27.4  11A- 27.5 | Calculate conversion efficiencies relating energy input to useful  energy output  Define power as the rate of doing work or converting energy and solve  problems using *P = W/t.* |
|  | 11A-30.2 | Explain the variation in resistance shown by devices such as the  potentiometer, the diode, the light-dependent resistor, the transistor and the  thermistor; use these resistors as potential dividers in practical circuits. |
|  | 12A-29.2 | State and apply Coulomb’s law relating to the force between two or more charged particles in air and on the field strength due to a charged particle. |
|  | 10A-30.7 | Know the pattern of the magnetic flux due to a single current-carrying wire,  a coil and a solenoid and know how an iron core can affect the field due to  a solenoid. |
|  | 10A-30.8 | Know that the magnetic field around a current-carrying conductor (both a  straight wire and a solenoid) can interact with a fixed magnetic field in  which it is placed, generating a force that can be detected, measured and  exploited. |
|  | 10A-30.8 | Know that the magnetic field around a current-carrying conductor (both a  straight wire and a solenoid) can interact with a fixed magnetic field in  which it is placed, generating a force that can be detected, measured and  exploited. |
|  | 10A-27.1  10A-27.2 | Describe the kinetic particle model for solids, liquids and gases, and relate  the difference in the structures and densities of solids, liquids and gases to  the spacing, ordering and motion of particles.  27 - 2Describe the kinetic particle model for solids, liquids and gases, and relate  the difference in the structures and densities of solids, liquids and gases to  the spacing, ordering and motion of particles. |
|  | 11A-32.7 | Distinguish between nuclear fission and nuclear fusion, and know how  heavier elements are formed in older stars by nuclear fusion |

**نماذج من الأسئلة**

**رقم المعيار ( 31. 3 -صف 10)**

|  |  |  |
| --- | --- | --- |
| 1 | **ثلاث مقاومات متصلة على التوالي قيمة كل منهما 15Ω ، أي مما يلي يمثل قيمة المقاومة الكلية ؟**  15Ω  15Ω  15Ω  [Image result for ‫صور مقاومات متصلة ع التوالي‬‎](http://www.google.com.tj/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=0ahUKEwi4rY227ozTAhVFnBoKHfGUB3QQjRwIBw&url=http://www.areeg.org/TLO.aspx?Type%3D1&psig=AFQjCNGXXxRbtrExhionnT5nexs2p6wcAw&ust=1491466090008291) | |
|  | a | **5Ω** |
|  | b | **25Ω** |
|  | c | **45Ω** |
|  | d | **60Ω** |

**رقم المعيار ( 10 -29.8)**

|  |  |  |
| --- | --- | --- |
| 2 | **أي من العدسات التالية تستخدم كنظارة طبية لعلاج مشكلة طول النظر ؟** | |
|  | a | **عدسة مستوية** |
|  | b | **عدسة مقعرة** |
|  | C | **عدسة محدبة** |
|  | d | **عدسة مزدوجه** |

**رقم المعيار (29. 8 – 10 )**

|  |  |  |
| --- | --- | --- |
| 3 | **أين تتكون الصورة في العين المصابة بقصر النظر ؟** | |
|  | a | **أمام الشبكية** |
|  | b | **خلف الشبكية** |
|  | C | **في منتصف الشبكية** |
|  | d | **في منتصف القرنية** |

**رقم المعيار ( 29. 4 -10 )**

|  |  |  |
| --- | --- | --- |
| 4 | **ما نوع المرآة المستخدمة على جانبي السيارة ؟** | |
|  | a | **مرآة محدبة** |
|  | b | **مرآة مقعرة** |
|  | c | **مرآة مستوية** |
|  | d | **مرآة مجمعة** |

**رقم المعيار ( 26.2-11 A )**

|  |  |  |
| --- | --- | --- |
| **5** | جسم كتلته 10 Kgويتحرك بسرعة مقدارها 3m/s ، فما كمية الحركة الخطية لهذا الجسم؟ | |
|  | a | **0.3 Kg.m/s** |
|  | b | **3.3 Kg.m/s** |
|  | c | **30 Kg.m/s** |
|  | d | **300 Kg.m/s** |

**رقم المعيار (11A – 27.3 )**

|  |  |  |
| --- | --- | --- |
| **6** | يسقط جسم كتلته (19 kg) من ارتفاع قدره(60 m) ، فما مقدار طاقة الوضع للجسم عند منتصف مسافة السقوط؟ استخدم) ( g = 10 m / S2 | |
|  | a | **5700 J** |
|  | b | **11400 J** |
|  | c | **22800 J** |
|  | d | **30010 J** |

**رقم المعيار ( 25.4 -12 A )**

|  |  |  |
| --- | --- | --- |
| **7** | قوة التنافر بين جسمين مشحونين 0.04 N ، ما قوة التنافر الجديدة إذا تضاعفت المسافة بينهما؟ | |
|  | a | **0.16 N** |
|  | b | **0.08 N** |
|  | c | **0.02 N** |
|  | d | **0.01 N** |

**رقم المعيار ( 25.4 -12 A )**

|  |  |  |
| --- | --- | --- |
| **8** | بناءً على قانون نيوتن في الجذب العام، فإن قوة التجاذب بين أي كتلتين تتناسب طرديا مع ....؟ | |
|  | a | **المسافة بين الكتلتين** |
|  | b | **سرعة الكتلتين** |
|  | c | **حاصل ضرب الكتلتين** |
|  | d | **مجموع الكتلتين** |